JOURNAL
OF THE
WASHINGTON ACADEMY OF SCIENCES

VOL. 48 OCTOBER 1958 No. 10

MATHEMATICS.—*A note on the group commutator of A and A**.

OLGA TAUSSKY
California Institute of Technology.

(Received September 17, 1958)

The following theorem (in generalized form) was proved by Putnam and Wintner [1] and Herstein [2].

THEOREM 1. *Let A, B be nonsingular $n \times n$ matrices over a field F of characteristic zero; suppose that A commutes with $AB - BA$. Then 1 is the only characteristic root of $A^{-1}B^{-1}AB$.*

This theorem gives a new and very brief proof of the following theorem (see Putnam [3], Kato and Taussky [4], Kaplansky in Halmos [5], Kleinecke [6], Sirokov [7]):

THEOREM 2. *Let A be a matrix with complex elements and A^* the transposed and complex conjugate matrix of A. Then A does not commute with $AA^* - A^*A$ unless the latter is zero.*

Proof of theorem 2. Let A be nonsingular. Assume that A commutes with $AA^* - A^*A$. Theorem 1 applied to the case $B = A^*$ shows that $A^{-1}A^{*-1}AA^*$ has only 1 as a characteristic root. Since this commutator is the product of two positive definite hermitian matrices it is similar to a diagonal matrix, hence it must be the unit matrix. This shows that $AA^* = A^*A$. In singular matrices we replace A by $A + rI$ where r is a suitable number and I the unit matrix.

A more general theorem obtained by the same method is the following:

THEOREM 3. *Let A, B be $n \times n$ matrices with complex coefficients. Let AB and BA be hermitian and positive definite and let A commute with $AB - BA$. Then $AB = BA$.*

I. Kaplansky raised the question whether the condition that AB and BA are positive definite hermitian implies that $AB = XX^*$ and $BA = X^*X$ for some matrix X. This is the case. For AB and BA have the same eigen values, hence are unitarily similar, i.e. $AB = UBAU^*$ for some unitary U. Put $X = (AB)^{1/2}U$ and the relations follow.

REFERENCES

[1] PUTNAM, C. R., and WINTNER, A. *On the spectra of group commutators.* Proc. Amer. Math. Soc. **9**: 360–362. 1958.

[2] HERSTEIN, I. N. *On a theorem of Putnam and Wintner.* Proc. Amer. Math. Soc. **9**: 363–364. 1958.

[3] PUTNAM, C. R. *On the spectra of commutators.* Proc. Amer. Math. Soc. **5**: 929–931. 1954.

[4] KATO, T., and TAUSSKY, O. *Commutators of A and A*.* Journ. Washington Acad. Sci. **46**: 38–90. 1956.

[5] HALMOS, P. R. *Commutators of operators II.* Amer. Math. Journ. **76**: 191–198. 1954.

[6] KLEINECKE, D. C. *On operator commutators.* Proc. Amer. Math. Soc. **8**: 535–536. 1957.

[7] SIROKOV, F. V. *Proof of a conjecture of Kaplansky.* Uspehi Matematiceskih Nauk. **11**: 157. 1956.

Physico-mechanical laws are, as it were, the telescope of our spiritual eye, which can penetrate into the deepest night of times past and to come.—HELMHOLTZ.

MATHEMATICS.—*On matrix commutators.* R. C. THOMPSON, California Institute of Technology. (Communicated by O. Taussky.)

(Received September 17, 1958)

Let M be an n row square matrix with elements in a field F. Shoda [1] proved that if F is algebraically closed, matrices A and B with elements in F exist such that $M = AB - BA$ if and only if trace $M = O$. Later Albert and Muckenhoupt [2] removed the restriction that F be algebraically closed. In this note we shall obtain a more special fact concerning Hermitian matrices with complex coefficients and zero trace. If X is a matrix of complex numbers, then by X^* we denote the conjugate transpose of X.

THEOREM 1. *If M is a Hermitian matrix of complex numbers and if trace $M = O$, then a matrix A of complex numbers exists such that $M = AA^* - A^*A$.*

Proof. There exists a unitary matrix U such that $UMU^* = D$ where $D = \text{diag}\,(d_1, d_2, \cdots, d_n)$ is a real diagonal matrix with diagonal elements $d_1 \geq d_2 \geq \cdots \geq d_n$. Since $O = \text{trace } M = \text{trace } D$, we have $d_1 \geq 0$ and $d_n \leq 0$. It suffices to find B such that $D = BB^* - B^*B$ (for then we take $A = U^*BU$). We assume tentatively that

$$B = \begin{vmatrix} 0 & b_1 & 0 & \cdots & 0 \\ 0 & 0 & b_2 & \cdots & 0 \\ \cdot & \cdot & \cdot & \cdots & \cdot \\ \cdot & \cdot & \cdot & \cdots & \cdot \\ \cdot & \cdot & \cdot & \cdots & \cdot \\ 0 & 0 & 0 & \cdots & b_{n-1} \\ 0 & 0 & 0 & \cdots & 0 \end{vmatrix}$$

and we shall prove that the numbers $b_1, \cdots, b_{n-1}$ can be found such that $D = BB^* - B^*B$. A simple calculation shows that $BB^* - B^*B = \text{diag}\,(|b_1|^2, |b_2|^2 - |b_1|^2, \cdots, |b_{n-1}|^2 - |b_{n-2}|^2, -|b_{n-1}|^2)$. Since $d_1 \geq 0$ we can determine b_1 such that $|b_1|^2 = d_1$. By induction we find the remaining b_i. Suppose that $b_1, \cdots, b_k$, $(1 \leq k \leq n-2)$ have been found such that

$$|b_1|^2 = d_1$$

$$|b_2|^2 - |b_1|^2 = d_2$$

$$\cdots$$

$$|b_k|^2 - |b_{k-1}|^2 = d_k .$$

If $d_{k+1} + |b_k|^2 \geq 0$, we may select b_{k+1} such that

$$|b_{k+1}|^2 - |b_k|^2 = d_{k+1} .$$

Moreover, it is not possible that $d_{k+1} + |b_k|^2 < 0$. For in this event we should have $d_{k+1} < 0$, and hence $d_{k+1} < 0$, $d_{k+2} < 0$, $\cdots$, $d_n < 0$. Since $d_1 + \cdots + d_k + d_{k+1} = |b_k|^2 + d_{k+1} < 0$, it would follow that $d_1 + \cdots + d_n < 0$, contradicting the hypothesis that $d_1 + \cdots + d_n = 0$.

Thus we may find $b_1, \cdots, b_{n-1}$. It remains to verify that $d_n = -|b_{n-1}|^2$. Since $d_1 + \cdots + d_n = 0$, we have

$$|b_1|^2 + (|b_2|^2 - |b_1|^2) + \cdots + (|b_{n-1}|^2 - |b_{n-2}|^2) + d_n = 0$$

and hence $d_n = -|b_{n-1}|^2$. This completes the proof.

Note that there is considerable freedom in the choice of A. We indicate two of the possibilities in Corollaries 1 and 2 below.

Corollary 1. *In Theorem* 1 *it is possible to choose A to be nonsingular.*

Proof. If I is the n row identity matrix, then if $D = BB^* - B^*B$ with B and D as above, we have $D = (B + I)(B + I)^* - (B + I)^*(B + I)$.

Corollary 2. *With M as in Theorem* 1, *complex matrices X and Y exist such that $M = AA^* - A^*A$ and $A = XY - YX$.*

Proof. From trace $B = O$, it follows that trace $A = O$, and so, by the Shoda-Albert-Muckenhoupt result, $A = XY - YX$ for certain matrices X and Y with complex coefficients.

If M is a matrix of real numbers, then $M^* = M^T$, the transpose of M. If M is real and symmetric there exists a real orthogonal matrix O such that OMO^T is a real diagonal matrix. Since the matrix B in the proof of Theorem 1 may be chosen to be a matrix of real numbers, we can establish the following Theorem 1′.

THEOREM 1′. *If M is a symmetric matrix of real numbers and if trace $M = O$, there exists a real matrix A such that $M = AA^T -$*

A^TA. *Moreover, we may choose A to be non-singular or such that $A = XY - YX$ for suitable real matrices X and Y.*

It was shown by Shoda in [1] that every unimodular matrix with complex coefficients can be expressed as the multiplicative commutator of two matrices: $M = C^{-1}D^{-1}CD$. If $D = C^*$, we have the following fact characterizing matrices of the form $C^{-1}C^{*-1}CC^* = (C^*C)^{-1}CC^*$.

THEOREM 2. *Let M be a unimodular matrix of complex numbers. Then a matrix C of complex numbers exists such that $M = (C^*C)^{-1}CC^*$ if and only if $M = HUH^{-1}U^{-1}$ where H is positive definite Hermitian and U is unitary.*

Proof. Suppose that $M = (C^*C)^{-1}CC^*$. Let $C = UK$ be the polar decomposition of C, where U is unitary and K is the positive definite square root of C^*C. Then $M = K^{-2}UK^2U^{-1} = HUH^{-1}U^{-1}$ if $H = K^{-2}$. Conversely, if $M = HUH^{-1}U^{-1}$, take $K = H^{-1/2}$ and put $C = UK$. Then $M = (C^*C)^{-1}CC^*$.

The author wishes to thank O. Taussky for suggesting these problems.

REFERENCES

[1] SHODA, K. *Einige Sätze über Matrizen.* Jap. Journ. Math. **13**: 361–365. 1936.

[2] ALBERT A. A., and MUCKENHOUPT, B. *On matrices of trace zero.* Michigan Math. Journ. **4**: 1–3. 1957.

DETERMINATION OF ACETYLENE IN LOW CONCENTRATIONS FOR AIR-POLLUTION CONTROL

A rapid, accurate, colorimetric method for detecting and measuring minute quantities of acetylene in air has been developed by the National Bureau of Standards in cooperation with the U. S. Public Health Service. Since acetylene in the air is associated with the contaminants from automobile exhaust gases, the method is expected to be useful in the study and monitoring of urban air pollution. The process,[1] developed by E. E. Hughes and R. Gorden, Jr., of the Bureau's gas analysis laboratory, permits detection of acetylene concentrations as low as 10 parts per billion. The equipment required is simple and portable, so that the method is well suited for field studies.

The first step in the procedure is to concentrate a measurable amount of the dispersed acetylene by adsorption on silica gel. The quantity of acetylene present is indicated by the depth of color produced when the silica gel surface is treated with a solution of ammoniacal cuprous chloride. Then the exact concentration is determined by visually comparing this color with those produced by gas samples containing known concentrations of acetylene.

[1] For further technical information, see HUGHES, E. E., and GORDON, R., JR., *A simple method for the determination of acetylene in air in concentrations from one part per million to ten parts per million*, Anal. Chem. (in press).

URBAN AIR CONTAMINANTS

A normal urban atmosphere contains a wide variety of gaseous inorganic and organic contaminants. These come mainly from industrial processes and vehicles—the internal combustion engine is a major source of the organic contaminants. Although the quantities of water vapor and oxides of nitrogen and carbon in exhaust gases have been determined, the organic fraction of "traffic gas" has never been completely analyzed. This remainder contains numerous hydrocarbons whose individual concentrations are too low for quantitative detection by previously available methods. The development of rapid procedures for the qualitative or quantitative determination of such substances has become of great importance for the early detection of changes in pollution patterns of certain areas. In particular, the analysis of certain substances—such as acetylene—which have been found in relatively constant concentrations in traffic gas, serves as a simple and practical means of determining the degree of contamination.

Besides its use in the study of air pollution, this method can be applied to other industrial or laboratory processes requiring the determination and fractionation of air constituents. For example, accumulation of solid acetylene in liquid air generators has caused numerous costly

and dangerous accidents. Although the permissible level of acetylene in the intake air is quite low, it can easily be detected by this procedure.

PROCEDURE

To begin the determination, a definite volume of air contaminated with the acetylene is drawn through a long, small-diameter glass tube containing highly purified silica gel. As the air sample passes through the tube, which has been cooled to the temperature of dry ice, acetylene is adsorbed on the gel's surface. A column of fine glass beads bounds the gel layer at each end of the tube, making possible easier detection of slight color changes. Because the acetylene collects mainly on the initial portion of the gel, the tube is allowed to warm to room temperature for a short time to obtain a homogeneous distribution. An ammoniacal solution of cuprous chloride—obtained by mixing a solution of ammoniacal cupric chloride with hydroxylamine hydrochloride—is then introduced into the tube and the copper acetylide formed precipitates directly on the gel surface. The resulting color ranges from pink to brown, depending on the quantity of acetylene.

When the concentration of acetylene in the atmosphere is 10 ppm or above, detectable quantities can be adsorbed at room temperature. At concentrations below 10 ppm, the gel must be cooled to −78°C, the temperature of dry ice. Because of increased adsorption at this temperature, it has been possible to detect concentrations as low as 10 parts per billion.

The concentration of acetylene in the unknown air sample is determined by comparing the color of the unknown with that of a tube exposed to a sample of known concentration. Mixtures of acetylene and air for the comparison samples are made by succesive dilution of a single gas mixture containing 1 percent acetylene.

Acetylene collected in the field can either be treated with the reagent immediately, or stored at a reduced temperature in liquid nitrogen and then returned to the laboratory for analysis. The final analysis does not have to be made immediately, because the collected acetylene which has been treated with the cuprous chloride solution can be stored for at least 48 hours without apparent loss of color.

In general, experiments indicate that this method can identify total adsorbed quantities of acetylene as low as 0.01 μg contained in 12 ml of air at a volume concentration of 1 ppm. To detect an equal amount of acetylene at a concentration of 0.1 ppm, it was only necessary to sample a volume of air ten times greater. Differences of 0.012 μg between specimens of acetylene were easily observed in the range of 0.00 to 0.237 μg.

Even though nature has the better of man, seeming to keep many of her secrets from him, he has an advantage of his own in that his thoughts may soar beyond nature while yet not fully comprehending her.—GOETHE.

PALEONTOLOGY.—*Notes on prionodont pelecypods.* DAVID NICOL, Southern Illinois University, Carbondale, Ill.

(Received September 4, 1958)

TIME OF ORIGIN OF THE PRIONODONTA

Newell (1954, p. 168) has given the first known appearance of several of the families and superfamilies of pelecypods. Unfortunately, however, he gave only the geologic Period in each case.

Data of a more precise nature on the first known appearance of the genera and higher categories of the Pelecypoda are of prime importance and should be presented when known. There are two reasons why this information is valuable. One is for the study of the phylogeny of the Pelecypoda. The second reason, which is the more immediately practical one, is the application to stratigraphy. This type of datum would be particularly important in regions where the stratigraphy is little known. Most families and orders appear quite suddenly in the record and become abundant and geographically widespread in an amazingly short geologic time. These major groups are usually quite distinct from their nearest relatives and can easily be identified even by the nonexpert.

One such sudden arrival on the scene is the very distinct pelecypod suborder Prionodonta, represented by the genus *Parallelodon*. The Prionodonta comprise the families Parallelodontidae, Cucullaeidae, Arcidae, Glycymeridae, and others. The prionodonts suddenly make their appearance in strata of the Hamilton Group of North America and the nearly corresponding (in time) Eifelian and Givetian Stages of Europe. In more general terms, this would be the Middle Devonian. Therefore, we can now say that if a stratum contains specimens of *Parallelodon* it probably is not older than Middle Devonian. Further study could probably delineate the first appearance of the prionodonts more precisely.

ADDITIONAL CUCULLAEID GENERA

Because of the continual introduction of new genera and the reranking or reallocating of others, the study of any family of pelecypods should be periodically reconsidered. W. H. Dall is said to have contended that any generic review of a molluscan family would be out of date and in need of revision within 25 years.

My study of the Cucullaeidae (Nicol, 1954) lacks one subgenus and one genus. The former I had overlooked, and the latter was proposed after my paper was published. To bring my work up to date, I now call them to the attention of other paleontologists. This brings to 23 the number of validly proposed genera and subgenera of cucullaeids.

Pleurogrammatodon Ichikawa and Maeda, 1958, pp. 63–64. Type species (original designation): *Pleurogrammatodon splendens* Ichikawa and Maeda, 1958; Upper Cretaceous, Campanian and/or Maestrichtian; Awaji Island and the Izumi mountain-range, Japan. Figured by Ichikawa and Maeda, 1958, pl. 1.

Spinarcullaea Chavan, 1952, pp. 10–11. Type species (original designation): *Arcullaea (Spinarcullaea) cristata* Chavan, 1952; Upper Jurassic, Astartien = Kimeridgian; Cordebugle (Calvados) France. Figured by Chavan, 1952, text fig. 3; pl. 1, figs. 14–15.

LITERATURE CITED

CHAVAN, A. *Les pélécypodes des sables astartiens de Cordebugle (Calvados).* Mem. Suisse Pal. **69**: 132, 4 pls. 1952.

ICHIKAWA, K., and MAEDA, Y. *Late Cretaceous pelecypods from the Izumi Group Part I. Cucullaeidae* (Pleurogrammatodon, *nov.*, Nanonavis, *and* Indogrammatodon). Journ. Inst. Polytech. Osaka City Univ., ser. G, **3**: 61–78, 2 pls. 1958.

NEWELL, N. D. *Status of invertebrate paleontology, 1953. V. Mollusca: Pelecypoda.* Bull. Mus. Comp. Zool. **112**(3): 161–172. 1954.

NICOL, D. *Nomenclatural review of genera and subgenera of Cucullaeidae.* Journ. Pal. **28**(1): 96–101. 1954.

BOTANY.— *Notes on South American phanerogams—II.* LYMAN B. SMITH, Department of Botany, U. S. National Museum.

(Received September 3, 1958)

As in the previous number of this series, the following notes are mainly the result of revisions that were necessary to name some of my own collections made in southern Brazil in 1956–57 with the help of a grant from the National Science Foundation. The plate has been prepared by Dr. Robert J. Downs, of the Plant Industry Station, U. S. Department of Agriculture.

Family GUTTIFERAE

Hypericum L. Sp. Pl. 783. 1753; H. G. Reichardt in Mart. Fl. Bras. **12,** pt. 1: 181. 1878; R. Keller, Bull. Herb. Boiss. II. **8:** 175. 1908; Pflanzenfam. ed. 2. **21:** 175. 1925.

KEY TO THE SPECIES OF EASTERN SOUTH AMERICA

1. Leaves more or less perfoliate-connate, broadly ovate; styles usually 5.
   2. Inflorescence 3-parted with a naked central peduncle and leafy laterals; leaves connate for less than half their width. 1. **H. subliberum**
   2. Inflorescence uniform; leaves nearly or completely connate.
      3. Leaves thin, subconcolorous, flat; inflorescence many-flowered. 2. **H. caprifoliatum**
      3. Leaves coriaceous, glaucous and black-glandular beneath; inflorescence few-flowered; styles usually 5, rarely 3. 3. **H. connatum**
1. Leaves not at all perfoliate, mostly narrower.
   4. Styles 5.
      5. Leaves imbricate, without axillary fascicles; internodes much shorter than the leaves; plants fruticose or suffruticose; inflorescences 1-few-flowered at the ends of the branches; cortex friable.
         6. Petals 7–10 mm long; stems much branched, to about 1 meter high.
            7. Leaves to 4 cm long, acuminate, rufescent beneath; pedicels 8–12 mm long. 4. **H. meridionale**
            7. Leaves about 1 cm long, broadly subacute. ..... 5. **H. sellowianum**
         6. Petals 15 mm long; stems simple or few-branched, 15–45 cm high; leaves narrowly lanceolate, concolorous; pedicels 2 mm long..... 6. **H. microlicioides**
      5. Leaves lax or with axillary fascicles; internodes mostly longer than the leaves; plants suffruticose or herbaceous; inflorescences few-many-flowered; cortex mostly persistent.
         8. The leaves linear or linear-lanceolate, revolute, obtuse.
            9. Plant much branched at base and forming a rosette; stems curved-ascending; leaves linear-lanceolate, slightly enlarged at base..... 7. **H. rivulare**
            9. Plant simple; stem erect, straight.
               10. Leaves attenuate at base, linear; plant with many lateral leafy 1-flowered branches. 8. **H. linoides**
               10. Leaves enlarged at base, linear-lanceolate.
                  11. Plant with many-flowered lateral branches.... 9. **H. lorentzianum**
                  11. Plant with few-flowered lateral branches; leaves 4 cm long. 10. **H. altissimum**
         8. The leaves broader or flat.
            12. Leaves lanceolate, acute or subacute. 11. **H. brasiliense**
            12. Leaves oblong to elliptic, obtuse.
               13. Base of leaf decurrent-clasping. 12. **H. megapotamicum**
               13. Base of leaf not decurrent-clasping.
                  14. Leaves rounded at base, 11 mm wide.... 13. **H. teretiusculum**
                  14. Leaves attenuate at base, much narrower.
                     15. Sepals exceeding the capsule. 14. **H. campestre**
                     15. Sepals distinctly shorter than the capsule. 15. **H. laxiusculum**
   4. Styles 3 or rarely 4.
      16. Leaves reduced to minute subulate scales, appressed; branches of the inflorescence strict, fastigiate; low herbs. 16. **H. gentianoides**
      16. Leaves broader, foliaceous.
         17. Plants low, soft, diffuse annuals; leaves ovate to oblong, obtuse. 17. **H. mutilum**
         17. Plants perennial with at least the bases woody; leaves mostly narrower, often acute.
            18. Flowers 5–6 mm in diameter; plants suffruticose.
               19. Leaves flat, narrowed toward base, linear, obtuse; sepals lanceolate. 18. **H. myrianthum**
               19. Leaves revolute, enlarged toward base; sepals ovate.
                  20. Stem deliquescent, merely angled; leaves lanceolate, acute. 19. **H. pelleterianum**
                  20. Stem erect, alate; leaves linear, obtuse. ..... 20. **H. notiale**
            18. Flowers 10 mm or more in diameter.
               21. Leaves broadly ovate or elliptic with a cordate base.
                  22. The leaves 3-nerved. 21. **H. cordiforme**

22. The leaves 1-nerved.
23. Stem erect, 1 meter high; leaves 12–18 mm long. 22. **H. rigidum**
23. Stem prostrate; leaves 5–10 mm long.
24. Leaves opposite; styles 3. 23. **H. denudatum**
24. Leaves ternate; styles 3–4. 24. **H. ternum**
21. Leaves narrower, not cordate.
25. The leaves oblong to elliptic or broadly lanceolate, flat.
26. Inflorescence dense, many-flowered, its bracts but slightly reduced from the leaves; fascicles in the axils of the major leaves. 25. **H. perforatum**
26. Inflorescence lax, few-flowered, its bracts greatly and abruptly reduced from the leaves; fascicles wanting in the axils of the major leaves. 26. **H. bonariense**
25. The leaves linear, mostly revolute.
27. Inflorescence many-flowered; sepals 4–8 mm long.
28. Sepals 4 mm long, ovate. 27. **H. polyanthemum**
28. Sepals 7–8 mm long, lanceolate. ..... 28. **H. legrandii**
27. Inflorescence very few-flowered; sepals 10–20 mm long.
29. Sepals pellucid-punctate, 10–12 mm long, equaling or exceeding the petals. 29. **H. hilaireanum**
29. Sepals black-punctate, 15–20 mm long. .... 30. **H. piriai**

1. **Hypericum subliberum** L. B. Smith, sp. nov. FIG. 1, *a–f*

Suffrutex, 6–8 dm altus, glaber, basi ramosus; caulibus erectis, plerumque simplicibus, basi teretibus, ca. 2 mm diametro, internodiis supremis ad 6 cm longis, inferioribus gradatim minoribus; foliis late ovatis, subacutis, 20 mm longis, 17 mm latis, basi breviter vel brevissime connatis, integris, distincte plurinervatis, subtus rufescentibus et dissite nigro-punctatis; cymis terminalibus, latis, sublaxis, ternatis, ea centrali submultiflora, pedunculo nudo praedita, duabus lateralibus paucifloris, pedunculis foliosis praeditis; axibus valde compressis, ad apicem versus ampliatis; bracteis lineari-lanceolatis, acuminatis, infimis 8 mm longis; pedicellis gracilibus, ad 4 mm longis, sulcatis; sepalis parum inaequalibus, lanceolatis, acuminatis, 6 mm longis, integris, 5–7-nervatis, nigro-glandulosis; petalis sepala subaequantibus, valde asymmetricis; staminum phalangibus quam petalis brevioribus, 15–20-andris, antheris valde inaequalibus; gynaeceo 4.5 mm longo, stylis 5, gracilibus, apice incrassatis; capsula ignota.

Type in the U. S. National Herbarium, no. 2266168, collected in bog, 22 km west of Curitibanos on the road to Campos Novos, near municipal boundary between the two, Santa Catarina, Brazil, altitude 850–950 meters, December 5, 1956, by L. B. Smith and R. Klein (no. 8318). Isotypes in Herbário "Barbosa Rodrigues" and Museu Nacional do Rio de Janeiro.

Additional specimen examined:

BRAZIL: Santa Catarina: Mun. Chapecó: In campo, Fazenda Campo São Vicente, 24 km west of Campo Erê, alt. 900–1,000 m, December 27, 1956, *L. B. Smith, Reitz & Sufridini* 9342-A (HBR, R, US).

2. **Hypericum caprifoliatum** Cham. & Schlecht. Linnaea **3:** 125. 1828.

Southern Brazil.

3. **Hypericum connatum** Lam. Encycl. **4:** 168. 1797; St.-Hil. Pl. Us. Brasil. *pl. 61.* 1828.

Southern Brazil, Uruguay, Paraguay, northern Argentina.

4. **Hypericum meridionale** L. B. Smith, nom. nov. *Hypericum rufescens* Kl. ex Reichardt in Mart. Fl. Bras. **12,** pt. 1: 194. 1878. Not Lam. 1797.

Southern Brazil: Paraná, Santa Catarina.

The Sellow collections which were the basis of *Hypericum rufescens* Kl. gave no location beyond southern Brazil. Collections from the vicinity of his route in Santa Catarina from Lajes to Mafra show considerable variation, but *Smith & Klein* 10665 (HBR, R, US) from Mafra agrees most closely with the photograph (F 9141) of Sellow material.

5. **Hypericum sellowianum** R. Keller, Bot. Jahrb. **58:** 195. 1923. Not Kl. ex Reichardt in Mart. Fl. Bras. **12,** pt. 1: 189. 1878. Nomen in synonymy.

Brazil. No state or locality given.

6. **Hypericum microlicioides** L. B. Smith, sp. nov. FIG. 1, *g–i*

Suffrutex parvus, facie *Microliciam* simulans, glaberrimus, basi pauciramosus; caulibus erectis, 15–45 cm altis, gracillimis sed lignosis, pauciramosis, anguste alato-quadrangulatis, maxima ex parte denudatis, internodiis 1.5–5 mm longis; foliis liberis suberectis, dense imbricatis, anguste lanceolatis, late subacutis, ad 15 mm longis, 4 mm latis, haud glandulosis, integris, concoloribus, anguste cartilagineo-marginatis, trinervatis, ner-

FIG. 1.—*a*, *Hypericum subliberum*, inflorescence, × 1/2; *b*, leaves, × 1; *c*, flower, × 1; *d*, sepal, × 1; *e*, phalange of stamens, × 1; *f*, gynoecium, × 1; *g*, *Hypericum microlicioides*, apex of plant, × 1; *h*, sepal, × 4; *i*, gynoecium, × 1; *j*, *Hypericum rivulare*, plant, × 1/2; *k*, sepal, × 1; *l*, gynoecium, × 1; *m*, *Hypericum piriai*, plant, × 1/2; *n*, sepal, × 1; *o*, petal, × 1; *p*, gynoecium, × 1.

vis supra impressis, subtus prominentibus et mediano basi alatocarinato; inflorescentiis in apicibus ramulorum terminalibus, unifloris vel paucifloris; pedicellis 2 mm longis; sepalis aequalibus, subfoliaceis, anguste lanceolatis, acuminatis, 12 mm longis, integris; petalis valde asymmetricis, subellipticis, 15 mm longis; staminum phalangibus quam petalis subtriplo brevioribus, ca. 15-andris; stylis 5, gracilibus, recurvatis, apice capitatis.

Type in the U. S. National Herbarium, no. 2266167, collected in alpine bog above general tree line, slopes of Morro Iquererim, Município of Campo Alegre, Santa Catarina, Brazil, altitude 1,500 meters, December 10, 1956, by L. B. Smith and R. Klein (no. 8535). Isotypes in the Herbário "Barbosa Rodrigues" and the Museu Nacional do Rio de Janeiro.

7. **Hypericum rivulare** Arech. Anal. Mus. Nac. Montevideo **3:** 109. 1898; Arech. Fl. Uruguay **1:** 109. 1898. FIG. 1, *j–l*

Uruguay. The type is from the banks of the Arroyo Tambores, Tacuarembo, *Arechavaleta* s. n. (MVFA).

8. **Hypericum linoides** St.-Hil. Fl. Bras. Merid. **1:** 333. 1827.

Southern Brazil.

9. **Hypericum lorentzianum** Gilg ex R. Keller, Bot. Jahrb. **58:** 199. 1923. In note under *H. altissimum*.

No specimen is cited, but there is a photograph (F 9134) of *Sellow* 4341 (B) from southern Brazil, that is labeled as this species. This collection was cited under *H. campestre* in the Flora Brasiliensis but is obviously different. The characters of *H. lorentzianum* were not given directly, but inferentially by comparison with *H. altissimum*.

10. **Hypericum altissimum** R. Keller, Bot. Jahrb. **58:** 199. 1923.

Paraguay.

11. **Hypericum brasiliense** Choisy in DC. Prodr. **1:** 547. 1824; Reichardt in Mart. Fl. Bras. **12,** pt. 1: 193, *pl. 34*. 1878.
Receveura graveolens Vell. Fl. Flum. 237. 1825; Icon. **5:** *pl. 120*. 1835.

11a. Var **brasiliense.**
Hypericum brasiliense var. *angustifolium* Reichardt in Mart. Fl. Bras. **12,** pt. 1: 193. 1878.

Leaves ca. 3 mm wide.

Southern Brazil, Uruguay, Paraguay, Argentina.

11b. Var. **latifolium** Reichardt in Mart. Fl. Bras. **12,** pt. 1: 193. 1878.
Hypericum punctulatum St.-Hil. Fl. Bras. Merid. **1:** 334. 1827.
Hypericum brasiliense var. *punctulatum* (St.-Hil.) R. Keller, Bull. Herb. Boiss. II. **3:** 1126. 1903.

Leaves ca. 5 mm wide.

Southern Brazil.

Hypericum brasiliense is extremely variable and extensive field studies are needed to define its limits and those of the related species noted here. Some of the latter are probably no better than forms.

12. **Hypericum megapotamicum** Malme, Ark. Bot. **23A,** no. 4: 17. 1930.

Southern Brazil.

13. **Hypericum teretiusculum** St.-Hil. Fl. Bras. Merid. **1:** 331. 1827.

Southern Brazil. This species was left as doubtful and not keyed in the Flora Brasiliensis, but a photograph (F 35261) of *Saint-Hilaire* 1385 (P) indicates its affinity with *H. brasiliense*.

14. **Hypericum campestre** Cham. & Schlecht. Linnaea **3:** 122. 1828.

Southern Brazil. In its extreme form with broadly rounded elliptic leaves, *H. campestre* appears distinct, but there are many intermediate forms between it and *H. brasiliense*.

15. **Hypericum laxiusculum** St.-Hil. Fl. Bras. Merid. **1:** 332. 1827; Plant. Us. Bras. *pl. 62*. 1828.

Southern Brazil.

16. **Hypericum gentianoides** (L.) B. S. P. Prelim. Catal. New York 9. 1888.
Sarothra gentianoides L. Sp. Pl. 272. 1753.

BRAZIL: Rio Grande do Sul: In wet sand, Osorio, Jan. 3, 1950, *Rambo* s. n. (US).

Hitherto the known range of this species has been wholly in the United States, from Florida and Texas to Maine and Wisconsin. It might be regarded as an introduction in the southern extremity of Brazil, but Padre Rambo is sure that its habitat indicates that it is native there and the rather similar range of *Proserpinaca palustris* L. (cf. Sellowia no. 6: 239, 240. 1954) would lend support to the idea of its being an old disjunct of the coastal plain.

17. **Hypericum mutilum** L. Sp. Pl. 787. 1753.
Hypericum euphorbioides St.-Hil. Fl. Bras. Merid. **1:** 332, *pl. 69*. 1827.

Southern Brazil and adjacent areas, northern Andes, eastern United States and Canada.

18. **Hypericum myrianthum** Cham. & Schlecht. Linnaea **3**: 123. 1828.

Southern Brazil.

19. **Hypericum pelleterianum** St.-Hil. Fl. Bras. Merid. **1**: 334, *pl. 70*. 1827.
Hypericum tamariscinum Cham. & Schlecht. Linnaea **3**: 124. 1828.

Southern Brazil.

20. **Hypericum notiale** L. B. Smith, nom. nov.
Hypericum parviflorum St.-Hil. Fl. Bras. Merid. **1**: 333. 1827. Not Salisb. 1796, nor Willd. 1802.

Southern Brazil.

21. **Hypericum cordiforme** St.-Hil. Fl. Bras. Merid. **1**: 330. 1827; Reichardt in Mart. Fl. Bras. **12,** pt. 1: 190, *pl. 33, fig. 2*. 1878.

Southern Brazil.

22. **Hypericum rigidum** St.-Hil. Fl. Bras. Merid. **1**: 336. 1827.

Southern Brazil.

23. **Hypericum denudatum** St.-Hil. Fl. Bras. Merid. **1**: 336. 1827.
Hypericum rigidum var. *humile* Reichardt in Mart. Fl. Bras. **12,** pt. 1: 189. 1878.

Southern Brazil.

24. **Hypericum ternum** St.-Hil. Fl. Bras. Merid. **1**: 330. 1827.

Southern Brazil. This is another case where a species treated as doubtful in the Flora Brasiliensis is clarified by a photograph (F 35262). It indicates that the species as shown by *Saint-Hilaire* 1585 closely resembles *H. cordiforme* in habit.

25. **Hypericum perforatum** L. Sp. Pl. 785. 1753.

Native of Europe, widely naturalized in temperate regions of North and South America.

26. **Hypericum bonariense** Griseb. Goett. Abh. **24**: 41. 1879.

Northwestern Argentina. The specific name would indicate the vicinity of Buenos Aires, but I find nothing to verify such an eastern range.

27. **Hypericum polyanthemum** Kl. ex Reichardt in Mart. Fl. Bras. **12,** pt. 1: 189. 1878.

Southern Brazil.

28. **Hypericum legrandii** L. B. Smith, nom. nov.
Hypericum ericoides Arech. Anal. Mus. Nac. Montevideo **4,** pt. 1: 18. 1902. Not L. 1753.

Uruguay. The type is from Rivera. The new specific name is in honor of Dr. C. Diego Legrand, Director of the Museo de Historia Natural, Montevideo, who has been most helpful in clarifying the Uruguayan species of *Hypericum*.

29. **Hypericum hilaireanum** L. B. Smith, nom. nov.
Hypericum tenuifolium St.-Hil. Fl. Bras. Merid. **1**: 337. 1827. Not Pursh 1814.

Southern Brazil.

30. **Hypericum piriai** Arech. Anal. Mus. Nac. Montevideo **3**: 108. 1898; Arech. Fl. Uruguay **1**: 108. 1898. FIG. 1, *m–p*

Uruguay. The type is from Pan de Azucar near Castillo de Piriápolis.

DOUBTFUL AND EXCLUDED SPECIES

Hypericum anceps Larrañaga, Escritos D. A. Larrañaga **2**: 239. 1923.

According to Dr. C. Diego Legrand, no herbarium specimens of Larrañaga's types now exist, and it is doubtful that he ever prepared any. His descriptions are inadequate for any positive comparison with species already well known. *H. anceps* may well be a synonym of *H. brasiliense* Choisy.

Hypericum botteri R. Keller, Pflanzenfam. ed. 2. **21**: 183. 1925. Nomen.

This species is included in a key and might therefore be considered as validly published, but the final heading includes it with two other species without any distinction.

Hypericum carinatum R. Keller, Bull. Herb. Boiss. II. **8**: 181. 1908.

There can be no doubt that this species is validly described by its inclusion in a completely definitive key. However, no specimen or photograph of it is now available, and the characters given in the key do not distinguish it clearly from the species in the foregoing synopsis.

Hypericum cyathifolium Larrañaga, Escritos D. A. Larrañaga **2**: 239. 1923.

As in *H. anceps* there is no type specimen and the description is inadequate. Probably it is a synonym of *H. connatum* Lam.

Hypericum paraguense R. Keller, Bull. Herb. Boiss. II. **8**: 181. 1908.

As in the case of *H. carinatum*, the species is validly published by inclusion in a key, but without material or further description it is not possible to place it in the present synopsis.

BOTANY.—*A new bromeliad from the Northern Range in Trinidad.* COLIN S. PITTENDRIGH, Princeton University. (Communicated by Lyman B. Smith.)

(Received September 16, 1958)

The peaks of the Northern Range of mountains in Trinidad are covered with a dense montane forest and in places with Elfin woodland. These forests carry a rich flora of epiphytic bromeliads including at least one endemic (*Vriesia broadwayi* Smith) and several other species (*Glomeropitcairnia erectiflora* Mez, *Aechmea ari-*

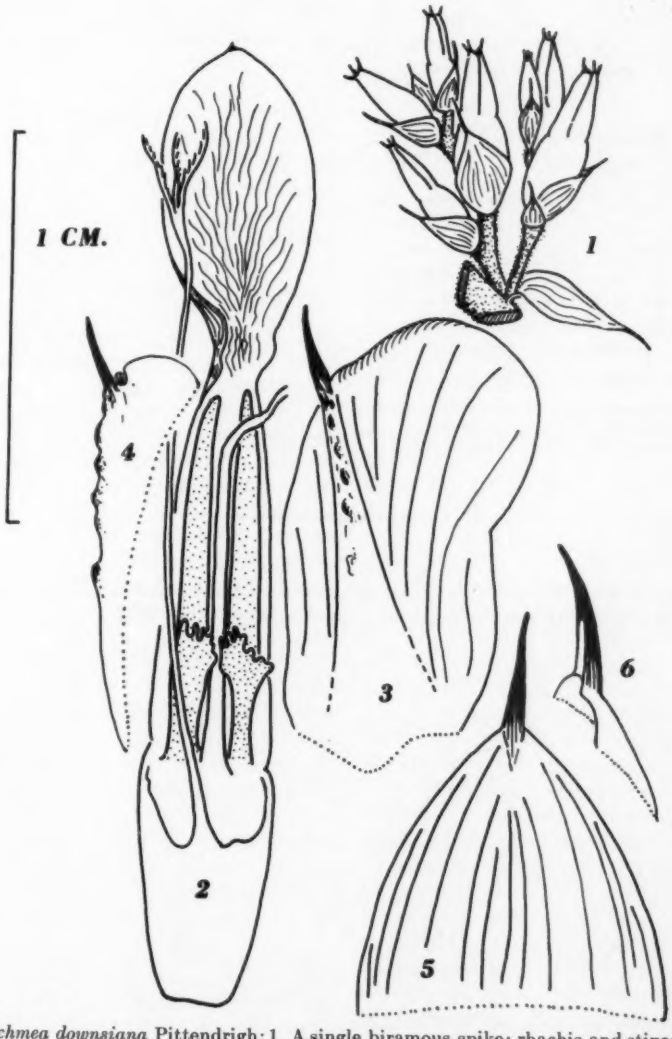

FIG. 1.—*Aechmea downsiana* Pittendrigh: 1, A single biramous spike; rhachis and stipes with a dense tomentum. 2, Flower; note the deep epigynous tube; petal scales stippled; anthers not available on the type specimen. 3 and 4, Sepal; note slight rugosity of carina. 5 and 6, Floral bract.

pensis (N. E. Brown) Pittendrigh,[1] *Vriesia Johnstonii* (Mez) Smith & Pittendrigh) which are known elsewhere only in the similar forests on the mountains of the adjacent Paria Peninsula and of the Island of Margarita.

The only peaks in the Trinidad Northern Range that have been thoroughly studied are El Tucuche and El Cerro del Aripo. A collection made on the previously unstudied Mount Chaguaramal in March 1942 revealed the expected *Glomeropitcairnia erectiflora* and *Aechmea aripensis*, and it included a new endemic *Aechmea* described below.

Aechmea (Aechmea) downsiana Pittendrigh, spec. nov. FIG. 1

Acaulis, ad 1 m alta; foliis rosulatis, suberectis, 6–10 dm longis et 4–6 cm latis, ligulatis, acutis, spinose serratis; scapo robusto, ad 1.25 cm diametro, erecto vel suberecto, densissime albo-lanato; scapi bracteis membranaceis, internodia superantibus, ellipticis, acuminatis, integris, lanatis; inflorescentia paniculata, plus minusve 15 cm longa, plus minusve 7 cm diametro, dense cylindrica, apice late rotundata, basi plus minusve interrupta; rhachi robusta, lanata; bracteis primariis eis scapi similibus, inferioribus ramos superantibus, superioribus quam ramis brevioribus; ramis in bractearum primariarum axillis binis, basi sterilibus nudisque, alibi omnibus usque ad apicem fertilibus, dense corymbosis, 10–15 floris; spicis paucifloris, geniculatis; bracteis florigeris plerumque quam ovario brevioribus sed rarissime ipso aequantibus, late cuneiformibus et valde mucronatis (mucro ad 4 mm), mucro incluso 11 mm longis, dense tomentoso-lepidotis, nervatis, floribus polystiche ordinatis, sessilibus; sepalis valde asymmetricis, liberis vel ad 2 mm connatis, mucronatis (mucro 3 mm longo), mucro incluso 12–13 mm longis, glabris; petalis liberis, 17–18 mm longis, caeruleis; ligulis binis 4 mm longis crenato-serratis praeditis; filamentis ad apicem versus plus minusve contortis; stylo stamina haud superante, incluso; stigma trifida; ovario ellipsoideo, 8 mm longo, glabro; tubo epigyno 3–4 mm profundo, placentis apicalibus, ovulis obtusis.

Epiphytic in the *Clusia intertexta* association, Mount Chaguaramal at 2500 feet, Trinidad, C. S. Pittendrigh 1301. Type in the U. S. National Herbarium. The plant is named in honor of my friend and fellow bromeliad student Dr. W. G. Downs.

[1] **Aechmea aripensis** (N. E. Brown) Pittendrigh, comb. nov. Basionym: *Gravisia aripensis* N. E. Brown, Bull. Torrey Bot. Club 53: 466. 1926.

All natural changes take place in such a way that the existing state of things suffers the least possible change.—MAUPERTUIS (1747)

ENTOMOLOGY.—*New Neotropical Hebridae, including a catalogue of the American species (Hemiptera).*[1]

CARL J. DRAKE, Smithsonian Institution, and HAROLD C. CHAPMAN, Rutgers University.

(Received August 26, 1958)

The present paper is based entirely upon specimens of the family Hebridae in the collections of the authors. It comprises the descriptions of four new species of the genus *Hebrus* Buchanan-White and one new *Merragata* Curtis, all inhabiting the Neotropical Region. The allotypes, both males, of two species of *Hebrus* recently described from the United States are also characterized. The catalogue enumerates a total of 40 species from North, South, and Insular Americas. Types of the new species are in the Drake Collection (U. S. N. M.).

In order to facilitate identification of species, the right parameres of 5 species of *Merragata* and of 14 species of *Hebrus* are illustrated. The male allotypes of *H. amnicus* Drake and Chapman (Fig. 1) and of *H. tuckahoanus* Drake and Chapman (Fig. 2) are also figured. Without illustrations, especially of male parameres, many hebrids are rather difficult to identify. The combinations of shape, sculpturing, and pilosity of the parameres provide reliable characters for the separation of the more troublesome species. Parameres of several hebrids not included in the discussions are also figured. We are indebted to Mrs. Richard Froeschner, Bozeman, Mont., for making Figs. 1 and 2 and to Mrs. Jerome Rozen, Alexandria, Va., for the rest of the illustrations.

Because most species of hebrids at present are known only in the macropterous state, we are listing below the different species (with distribution) represented by either apterous or brachypterous forms in our collections.

Apterous form: Hebrus tuckahoanus Drake and Chapman (Fig. 2) is known so far only in the totally apterous condition from the type, allotype, paratypes, and a few other specimens, all collected near Tuckahoe, N. J.

Brachypterous form: Hebrus amnicus Drake and Chapman (Fig. 1) is represented solely by short-winged specimens—holotype, allotype, and other specimens netted near Calhoun, Ga. The wing-pads are very long, with apices reaching beyond middle of abdomen. Alate form is unknown.

H. piercei Porter (Fig. 6*d*) is represented by a single brachypterous specimen from Arizona (Oak Creek Canyon). *H. consolidus* Uhler (Fig. 5*c*) is not infrequently taken in both long- and short-winged forms. We have many brachypterous specimens from Florida (Cocoa, Mims, Center Hill, Apopka, and Titusville). *H. burmeisteri* Lethierry et Severin (Fig. 5*b*) is probably more frequently encountered in pterygodimorphic condition than other members of the genus. Brachypterous specimens of the latter are at hand from Washington, D. C., Virginia (Fairfax County), Pennsylvania (Philadelphia), New York (Long Island), and New Jersey (Andover, Helmetta, Jamesburg, Tuckahoe, and New Brunswick).

Merragata hebroides Buchanan-White (Fig. 4*b*) occurs almost always in the long-winged state. However, we have brachypterous specimens from Ohio (Ira), Florida (Merritt Island), and Canada (Quebec). On the other hand, *M. brunnea* Drake (Fig. 4*c*) is commonly found in both short- and long-winged forms. Our collections contain brachypterous forms from Ohio (Hebron, Rockbridge, Prentiss, and Hocking County), Michigan (Ingham, Livingston, and Washington Counties), New Jersey (New Brunswick), and Florida (Center Hill, Orlando, Indian River City, Union Park, Holly Hill, Mims, Gainesville, and Titusville).

Distribution: Merragata and *Hebrus* are the only genera of hebrids represented in the New World, and all the 40 described species are indigenous; *M. hebroides* is by far the

[1] Paper of the Journal Series, New Jersey Agriculture Experiment Station, Rutgers University, State University of New Jersey, Department of Entomology.

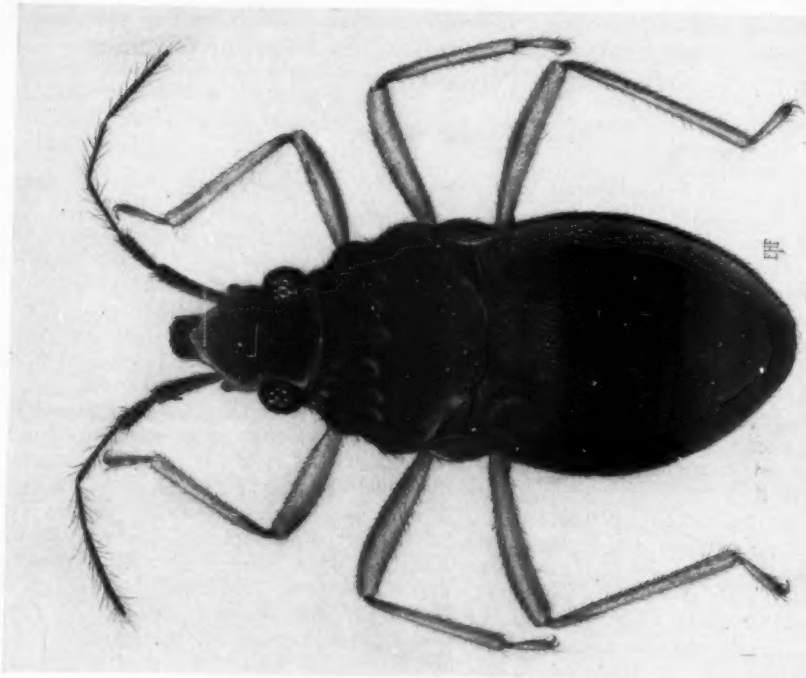

FIG. 2.—*Hebrus tuckahoanus* D. & C., male allotype.

FIG. 1.—*Hebrus amnicus* D. & C., male allotype.

most generally and widely dispersed species. Although originally described from the Hawaiian Islands (probably introduced there from the Americas) it is an inhabitant of all the Americas, save perhaps Chile. *M. lindbergi* Poisson described from Canary Islands has recently been suppressed as a synonym of *hebroides*.

As depicted in Table 1, the hebrid fauna is richest in species in the Neotropical Region, especially in the tropics. The Nearctic region is inhabited by 15 species and the Neotropical by 31. Six species are shared by both regions.

TABLE 1.—DISTRIBUTION OF AMERICAN HEBRIDAE

Genus	Number of species	Faunal regions		Number of species inhabiting both regions
		Nearctic	Neotropical	
Merragata.....	9	3	8	2
Hebrus.....	31	12	23	4
Total.....	40	15	31	6

Merragata lacunifera (Berg) (Fig. 3)

Lipogomphus lacuniferus Berg 1879: 287.
Merragata lacunifera Champion 1898: 198.

Known only in macropterous form. Widely distributed in Argentina, Brasil, Bolivia, Uruguay, and Paraguay. Often found in numbers at the water's edge of ponds, slow-moving parts of sluggish streams, and quiet, secluded coves of lakes. The male can be separated at once from other members of *Merragata* by the subapical spine (Fig. 3*b*) on the hind face of the posterior tibia. The male paramere (Fig. 3*a*) is also distinctive.

Merragata accola, n. sp.

Macropterous form: Small, brownish testaceous, with posterior part of pronotum and exterior margins of scutellum tending to be blackish; hemelytra fuscous black with space between closed cell and a short basal stripe within next to inner vein brownish or testaceous; veins blackish tending to become brownish basally; body beneath dark reddish fuscous with sterna and pleura brownish testaceous. Appendages testaceous. Length 1.80 mm; width (across humeri) 0.72 mm.

Head 0.40 mm wide across eyes, with median longitudinal furrow. Antennae testaceous, moderately slender, with last two segments fairly slender, sparsely and rather shortly hairy, measurements: I, 10; II, 8; III, 17; IV, 20. Labium long, extending to abdomen. Legs testaceous, moderately stout. Pronotum very coarsely punctate, width across humeri much greater than median length (58: 32), with front lobe shorter (14: 18) and narrower than hind lobe (42: 58) with lateral sides of both lobes convex; front lobe with collar set off by an encircling row of pits, also with a transverse row of larger pits between lobes; hind lobe with several large pits, broadly, subfurcately impressed on median line, with a double row of pits at bottom of furrow, the humeral angles within marked off by a longitudinal impression. Scutellum twice as wide at base as median length (30: 16) with exterior margins raised, with low median carina, with apex broadly truncate and not bifid.

Holotype (male), Los Amates, Guatemala, collected by Dr. Kellerman. Female unknown.

Narrower and paler than *M. brevis* Champion with apex of scutellum truncate and not incised, pronotum with double row of punctures in shallow median longitudinal furrow, antennae distinctly shorter. Separated from *M. truxali* Porter by shallower median furrow of pronotum, truncate apex of abdomen and antennal measurements.

Hebrus amnicus Drake & Chapman (Fig. 5*f*)

Hebrus amnicus Drake and Chapman, 1953: 10.

This species was originally described from a single brachypterous female, found hibernating under a stone, Calhoun (Gordon County), Ga., 4.ii.1953. Recently the junior author collected four males and seven females, all brachypterous, from the same, tiny, spring-fed stream (type spot) by washing them off of the wet, grassy bank adjacent to the edge of the water into the stream. Efforts to collect this hebrid on the surface of the water before pouring water up on the bank were entirely fruitless.

Brachypterous male (Fig. 2): Slightly smaller than female but with same form, color, markings, and general aspect. Wing-pads long, reaching beyond middle of abdomen, blackish fuscous, with a very small, basal, pale spot on each side adjacent to the scutellum. Antennal measurements as in female. Allotype (Fig. 2) and a paramere (Fig. 5*f*) of another male specimen are figured. Macropterous form unknown. Length 2.10 mm; width (humeral angles) 0.70 mm.

FIG. 2.—*Hebrus tuckahoanus* D. & C., male allotype.

FIG. 1.—*Hebrus amnicus* D. & C., male allotype.

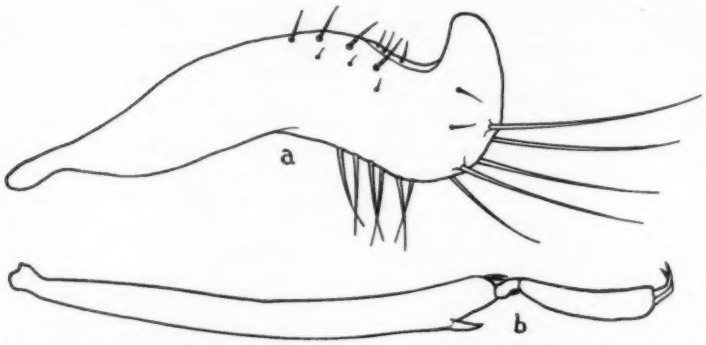

FIG. 3.—*Merragata lacunifera* (Berg) (male): *a*, Right paramere; *b*, hind tibia showing subapical spine

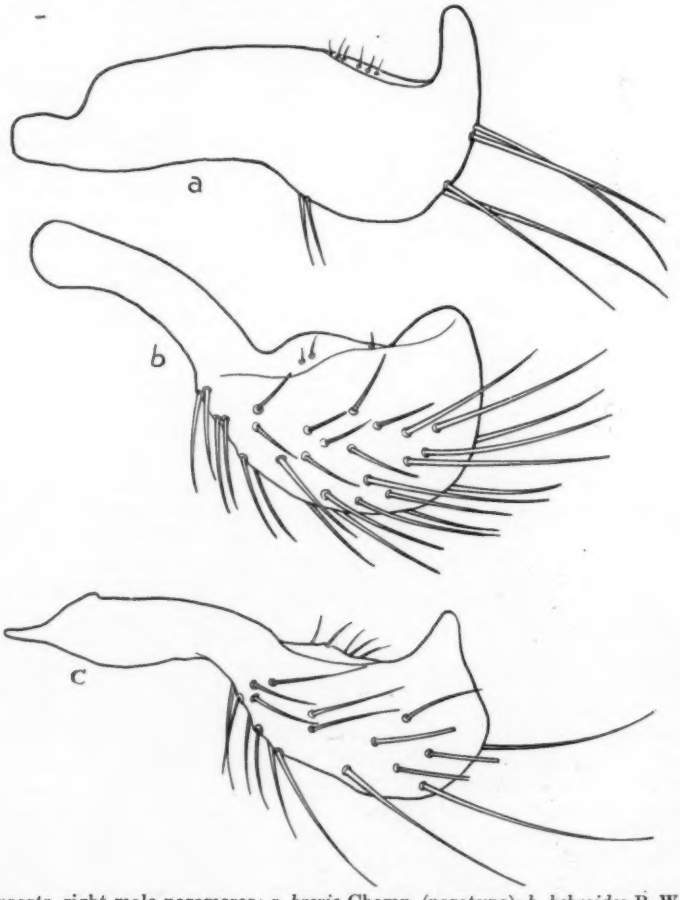

FIG. 4.—*Merragata*, right male parameres: *a*, *brevis* Champ. (paratype); *b*, *hebroides* B.-W.; *c*, *brunnea* Drake.

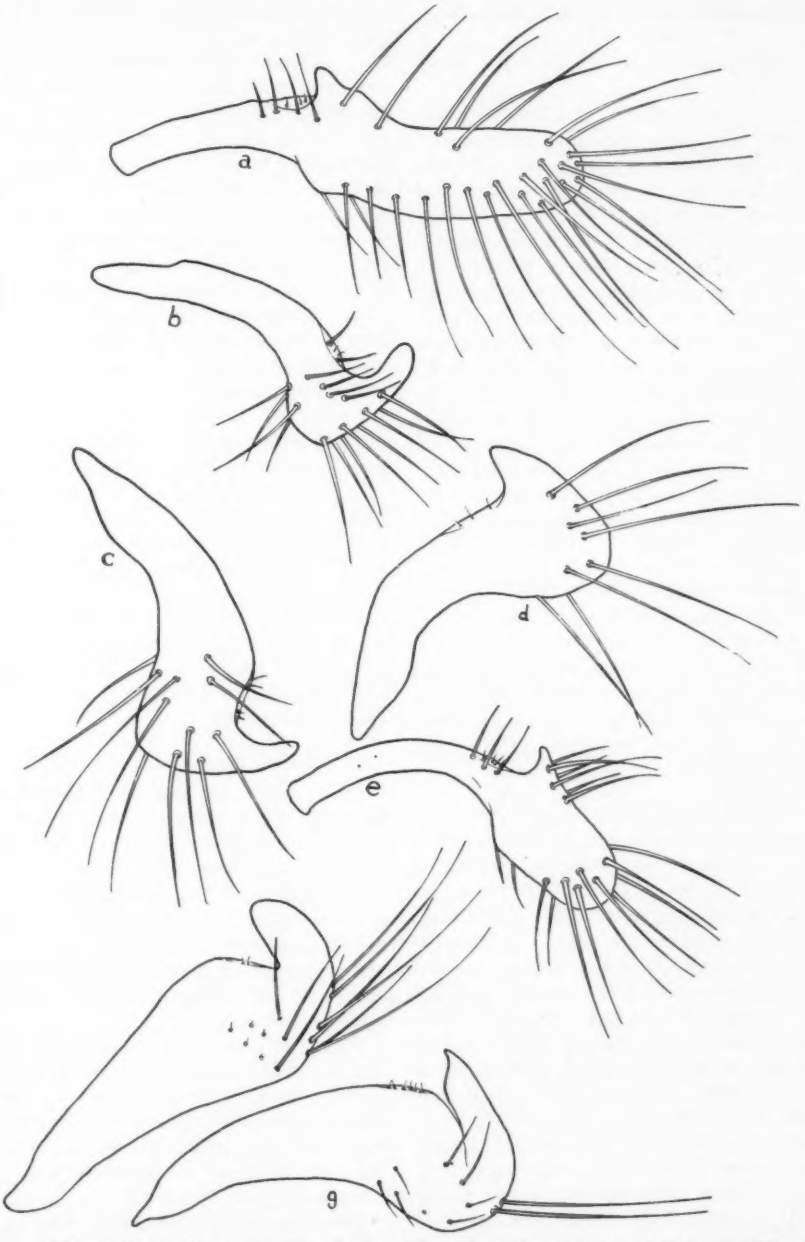

FIG. 5.—*Hebrus*, right male parameres: *a, comatus* D. & H.; *b, burmeisteri* L. & S.; *c, consolidus* Uhler; *d, tuckahoanus* D. & C.; *e, buenoi* D. & H.; *f, amnicus* D. & C.; *g, limnaeaus* D. & C.

Hebrus tuckahoanus Drake and Chapman (Figs. 2, 5*d*)

Hebrus tuckahoanus Drake and Chapman, 1954: 152.

Originally characterized from two females, collected by submerging vegetation growing in a small drainage ditch in a fresh water impoundment and then dipping the specimens from the water surface, 2.vi.1953, Tuckahoe, N. J. Since the species was originally described, eighteen additional specimens comprising both sexes, have been taken in another fresh water impoundment near Tuckahoe, N. J., 20.ix.1954 and 11.v.1958. The latter specimens were obtained by splashing water against the low, wet, grassy sides of the ditch in order to wash the hebrids into the water.

Apterous male: Slightly smaller than female, with same form, color, markings, and general appearance. Wing-pads also absent. Allotype and paramere of another male (Fig. 5*d*) are figured. Macropterous form unknown. Length 1.70 mm; width 0.70 mm.

Hebrus major Champion (Fig. 6*b*)

Hebrus major Champion, 1898: 118, fig.
Hebrus acapulcana Drake and Chapman, 1954: 152.

As a study of more specimens of *major* and of *acapulcana* from Mexico shows that these two names apply to the same species, the latter is here placed in synonymy. (New synonymy.)

Hebrus engaeus, n. sp.

Large, blackish fuscous with hemelytra lighter in color, more brownish fuscous and marked on each side with a small, basal, whitish spot adjacent to scutellum; head, pronotum and body beneath with some grayish blue pruinose, especially next to eyes; head and pronotum above sparsely furnished with very short golden pubescence, the basal part of hemelytra more abundantly provided with slightly longer, golden pubescence; sterna and median part of venter clothed with short, yellowish brown hairs. Length 3.00 mm; width (across humeri) 1.05 mm.

Head moderately declivent, with median longitudinal furrow. Labium long, pale fuscous, extending to venter. Antennae long, brown, clothed with short, pale hairs, last three segments quite slender, measurements: I, 28; II, 25; III, 29; IV, 22; V, 20. Legs unarmed, brownish fuscous with tibiae and tarsi blackish, clothed with short, pale, pubescent hairs.

Pronotum with front lobe strongly concavely constricted laterally, much wider across humeral angles than at widest point of anterior lobe (55: 88); anterior lobe depressed, coarsely pitted, with two rows of pits forming a shallow, median, longitudinal furrow and also a pair of furrows, one on each side of the median furrow; collar short, set off by an encircling row of small pits; posterior lobe transversely convex, with pits largely inconspicuous, the humeral angles slightly elevated. Scutellum deeply impressed, with lateral and hind margins carinate, with prominent median carina, wider at base than median length, rather sharply obliquely narrowed on lateral sides to apical two-fifths, thence with lateral sides slowly rounded, the apex bluntly rounded and without notch. Hemelytra as long as the abdomen, not completely covering connexiva; veins raised, wide, the inner vein slowly convexly rounded on inner and apical margins. Female feebly larger than but very similar in general aspect to male.

Holotype (male) and *allotype* (female), Tucuman, R. A., Argentina, 2,000 meters, 8.x.1948, P. Wygodzinsky.

This species is a little larger than most of the South American members of the genus. The structure of the pronotum, shape of scutellum, and especially the long male parameres are distinctive characters.

Hebrus lacunatus, n. sp. (Fig. 6*h*)

Small, dark brown tinged with fuscous, median longitudinal part of head, scutellum and hemelytra largely dark fuscous. Body beneath dark fuscous with venter black-fuscous and shiny. Dorsal surface of head, pronotum and hemelytral veins sparsely furnished with tiny, scalelike, golden pubescence. Legs yellowish testaceous with upper face of femora largely dusky, clothed short pubescence. Length 2.00 mm; width (across humeri) 0.85 mm.

Head with distinct, median, longitudinal groove. Labium extending between hind coxae, flavous; bucculae flavous, sides of sulcus dark brown to dark fuscous. Antennae brownish testaceous, clothed with yellowish pubescence, the hairs a little longer on last three segments, measurements: I, 13; II, 10; III, 17; IV, 12; V, 15.

Pronotum much wider across humeral angles than median length (64: 35), with pits largely inconspicuous except on hind part of front lobe, with a moderately wide, deep, longitudinal furrow extending posteriorly from just behind collar to base of hind lobe, with a deep pit in

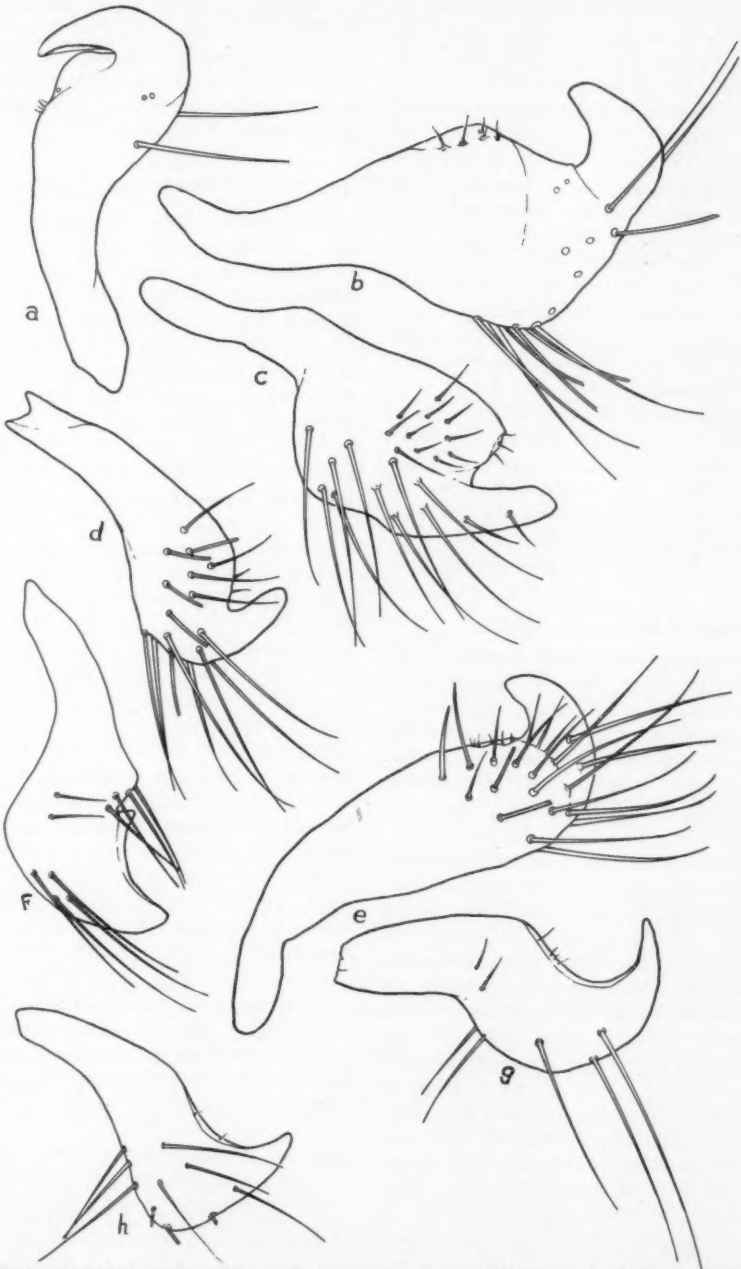

FIG. 6.—*Hebrus* and *Merragata*, right male parameres: *a*, *H. nubilis* D. & H.; *b*, *H. major* Champ.; *c*, *H. sobrinus* Uhl.; *d*, *H. piercei* Porter; *e*, *H. concinnus* Uhl.; *f*, *H. catus* D. & C.; (holotype); *g*, *M. leucosticta* Champ.; *h*, *H. lacunatus* D. & C. (holotype.)

bottom of furrow between lobes; front lobe depressed, with lateral sides forming a convex line, much shorter and narrower than hind lobe; humeri within set off by a longitudinal furrow. Scutellum with median carina, rimmed on lateral and hind margins, bifed at apex. Hemelytra dark brown with a small, sharply defined small basal white spot on each side of scutellum; veins dark brown, with apical vein closing cell blackish and sharply obliquely truncate. Legs moderately stout. Brachypterous form unknown.

Holotype (macropterous male) taken in a small, deep, stagnant pool near a river, Ciudad Valles, Mexico, 8.viii.1950, C. J. Drake. *Paratype* (male), Tampico, Mexico, 16.vii.1950, taken in a small drainage ditch.

This species can be distinguished from *H. sobrinus* Uhler by its smaller form, and the clearly defined, small, basal, white spot on each side of the scutellum. The parameres are also different (Fig. 6*c*, *h*). This species also resembles *H. limnaeus*, n. sp. from southern Brasil, but is smaller and also has differently shaped parameres.

Hebrus catus, n. sp. (Fig. 6*f*)

Small yellowish brown with humeral angles and hemelytral veins brownish fuscous; membrane infuscate with three, small, fairly distinct, whitish spots; base of elytra between veins and next to scutellum pale; body beneath yellowish testaceous; dorsal surface sparsely provided with tiny, scale-like, golden pubescence. Length 1.80 mm; width 0.70 mm.

Head with prominent, median, longitudinal furrow; eyes coarsely granulate, dark fuscous; labium yellowish testaceous, extending between hind coxae. Antennae brownish testaceous, with first segment longer than second, other segments missing. Pronotum with punctures between lobes moderately large and distinct, with a wide, rather shallow, median, longitudinal furrow; front lobe depressed, much narrower than hind lobe (42: 58), with the short collar set off by an encircling row of small pits, with lateral sides forming a convex line; hind lobe with punctures largely concealed, transversely convex, with humeral angles set off within by a shallow, longitudinal furrow. Scutellum slightly wider at base than median length, with distinct median carina, with exterior margins rimmed, the apical part rounded and notched at middle. Inner vein of elytra with interior margin slowly rounded, obliquely truncate at apex. Legs yellowish brown.

Holotype (male), Canal Zone, Panama, 10.2.39, C. J. Drake.

The structures of pronotum and scutellum as described above and the male paramere (Fig. 6*f*) distinguish this species from other Neotropical members of the genus.

Hebrus limnaeus, n. sp. (Fig. 5*g*)

Small, rufous-brown with median longitudinal part of head, posterior part of front lobe of pronotum fuscous; hemelytra with a small basal white spot on each side of scutellum, with veins blackish fuscous; hemelytral membrane dark fuscous, without spots; head beneath, bucculae and labium flavo-testaceous, the labium extending between hind coxae. Legs flavus with dorsal surfaces of femora and tibiae mostly dark brown or dark fuscous, the pubescence short and pale. Antennae brownish, pubescent, with last three segments missing. Length 2.25 mm; width 0.85 mm.

Pronotum with moderately large pits, those between lobes larger than the others, with median longitudinal furrow, wider across humeri than median length (68: 40). The front lobe much narrower than hind lobe (48: 68). Front lobe depressed, with lateral sides forming a convex line, with a large pit in deepest part of median sulcus (almost between the two lobes); collar very short, set off by an encircling row of small pits; hind lobe transversely convex, with a row of pits bordering hind margin, the humeri moderately prominent. Scutellum incised at apex. Hemelytra clothed with short yellowish brown hairs on coriaceous part, with veins prominent, nearly straight, with margin behind closed cell obliquely truncate. Abdomen beneath blackish fuscous, with matted, grayish pubescence. Male parameres as in Fig. 1.

Holotype (male), Santa Catarina, Nova Teutonia, Brasil, 26.v.1941, Fritz Plaumann.

The small white spot at base of each hemelytron and the male parameres separate it from other Brasilian species.

Family Hebridae Fieber, 1851

Hebrides Amyot et Serville, 1843

Naeogeidae Kirkaldy, 1902

Type genus, *Hebrus* Curtis, 1833.

Genus **Merragata** Buchanan-White, 1877

Lipogomphus Berg, 1879: 286

Type species, *Merragata hebroides* Buchanan-White, 1877.

1. **accola** Drake and Chapman, n. sp. Guat.
2. **brevis** Champion, 1898: 122. Mex., Guat., Pan., U.S. (Fla., Texas, Calif.)
3. **brunnea** Drake, 1917: 105. U.S. (east of Rocky Mts.), Canada (southern)
4. **hebroides** Buchanan-White, 1877: 114. Americas from southern Canada into Argentina (not reported from Chile); Hawaiian Islands; Africa (Cape Verde Islands)
   foveata Drake, 1917: 103.
   slossoni Van Duzee, 1921: 133.
   lindbergi Poisson, 1954: 2.
5. **leucosticta** Champion, 1898: 122. Guat., Nic., Pan.
6. **lacuniferus** (Berg), 1897: 287. Arg., Bras., Bol., Para., Urug.
7. **quieta** Drake, 1952: 194. Colom., Mex., Pan.
8. **sessoris** Drake and Harris, 1943: 44. Bras.
9. **truxali** Porter, 1955: 27. Mex.

Genus **Hebrus** Curtis, 1879

Naeogeus Laporte de Castelnau, 1832

Type species, *Hebrus pusillus* (Fallen) (as *Lygaeus*).

10. **amnicus** Drake and Chapman, 1953: 10. U.S. (Ga.)
11. **beameri** Porter, 1952: 9. U.S. (Kans.)
12. **bilineatus** Champion, 1898: 119. Mex.
13. **buenoi** Drake and Harris, 1943: 52. U.S. (N.Y., N.J., Mass., Va., Pa., Wash. D.C., Miss., Fla., Ohio, Mich., Wis., Ill., Iowa, Kans., Colo.)
14. **burmeisteri** Lethierry et Severin, 1896: 51. Mex., U.S. (N.Y., N.J., Pa., Va., Md., Mass., D.C., S.C., Ga., Fla., Ky., Mich., Wis., Iowa, Mo., Kan., Ill.)
   pusillus Burmeister, 1835: 214 (in part, nec Fallen).
15. **camposi** Drake and Chapman, 1954: 151. Ecua.
16. **catus** Drake and Chapman, n. sp. Pan.
17. **comatus** Drake and Harris, 1943: 53. U.S. (N. Mex., Tex.)
18. **concinnus** Uhler, 1894: 221. W.I. (Grenada), Peru, Pan., Costa Rica, Mex., U.S. (Mass., N.Y., N.J., Pa., Md., N. Car., S. Car., Fla., Ill., Col., Ariz., N. Mex., Calif., Okla., Wash.)
19. **consolidus** Uhler, 1894: 222. W.I. (Grenada, Trinidad, Kingston, Jamaica), Pan., Guat., Mex., U.S. (La., Miss., Fla.)
20. **ecuadoris** Drake and Harris, 1943: 55. Ecua.
21. **engaeus** Drake and Chapman, n. sp. Arg.
22. **gloriosus** Drake and Harris, 1943: 47. Bras.
23. **hirsutus** Champion, 1898: 119. Mex.
24. **hubbardi** Porter, 1952: 10. U.S. (Calif.)
25. **hungerfordi** Drake and Harris, 1943: 58. Ecua.
26. **lacunatus** Drake and Chapman, n. sp. Mex.
27. **laeviventris** Champion, 1898: 120. Pan.
28. **limnaeus** Drake and Chapman, n. sp. Bras.
29. **major** Champion, 1898: 118. Mex., U.S. (Ariz., Calif.)
   acapulcana Drake and Chapman, 1954: 56.
30. **nubilis** Drake and Harris, 1943: 56. Mex.
31. **parvulus** Stål, 1858: 60. Bras.
32. **paulus** Drake and Harris, 1943: 47. Bras.
33. **piercei** Porter, 1942: 147. U.S. (Ariz., N. Mex., Tex.)
34. **plaumanni** Porter, 1952: 12. Bras.
35. **priscus** Drake and Harris, 1943: 57. Bras., Peru, Pan., Para.
36. **pudoris** Drake and Harris, 1943: 56. Mex., Costa Rica
37. **sobrinus** Uhler, 1877: 452. U.S. (Ga., Va., Tex., Calif., Vt., Ariz., N. Mex.)
38. **sulcatus** Champion, 1898: 120. Pan.
39. **tuckahoanus** Drake and Chapman, 1954: 152. U.S. (N.J.)
40. **usingeri** Drake and Harris, 1943: 54. Mex.

LITERATURE CITED

BERG, CAROLUS. *Hemiptera Argentina:* 1–316. 1879.

BUCHANAN-WHITE, F. *Descriptions of new species of Hemiptera-Heteroptera collected in the Hawaiian Islands by Rev. T. Blackburn.* Ann. Mag. Nat. Hist. **20** (4): 110–114. 1877.

BURMEISTER, HERMANN. *Handbuch der Entomologie* **2**: 214. 1835.

CHAMPION, G. C. *Biologia Centrali-Americana, Rhynch.* **2**: 117–123, 12 figs. 1898.

DRAKE, CARL J. *A survey of the North American species of* Merragata. Ohio Journ. Sci. **17** (4): 103–105, 2 figs. 1917.

———. *A new tropical hebrid.* Pan-Pacific Ent. **23** (4): 194. 1952.

DRAKE, CARL J., and CHAPMAN, H. C. *Distributional data and description of a new hebrid (Hemiptera).* Great Basin Nat. **13** (1–2): 9–11. 1953.

———. *New American water-striders (Hemiptera).* Florida Ent. **37** (3): 151–155. 1954.

DRAKE, CARL J., and HARRIS, H. M. *Notas sobre Hebridae del Hemispheric occidental (Hemiptera).* Notas Mus. Plata (Argentina), Zool. **8** (64): 42–58. 1943.

LETHIERRY, L., ET SEVERIN, G. *Cat. Gen. Hem.-Het.* **3**: 51–52. 1896.

POISSON, RAYMOND. *Deux Hebrides (Hem.-Het.) nouveaux des Canaries.* Soc. Sci. Fennica, Com. Biol. **14** (4): 1–4, 2 figs. 1951.

PORTER, T. WAYNE. *Three new species of Hebridae (Hemiptera) from the Western Hemisphere.* Journ. Kans. Ent. Soc. **25** (1): 9–12, 6 figs. 1952.

———. *A new species of Hebridae (Hemiptera) from the Southwest.* Journ. Kans. Ent. Soc. **25** (4): 147–149, 4 figs. 1952a.

———. *Brachypterous form of* Hebrus consolidus *Uhler (Hemiptera, Hebridae).* Journ. Kans. Ent. Soc. **27** (1): 38–39, 2 figs. 1954.

———. *A new species of* Merragata *(Hemiptera) from Mexico.* Journ. Kans. Ent. Soc. **28** (1): 27–28, 4 figs. 1955.

STÅL, CARLOS. *Bidrag till Rio de Janeiro-Trakeens Hemiptera-Fauna.* Vet. Akad. Handl. **1**: 60. 1858.

UHLER, PHILIP R. *Report upon the insects collected by P. R. Uhler during the explorations*

of 1875, including monographs of the families Cydnidae and Saldidae, and the Hemiptera collected by A. S. Packard. Bull. Geol. and Geogr. Surv. 1877, **2**: 355–475. 1877.

———. *On the Hemiptera-Heteroptera of the Island of Grenada.* Proc. Zool. Soc. London 1894: 221.

VAN DUZEE, EDWARD P. *Characters of some new species of North American hemipterous insects, with one new genus.* Proc. California Acad. Sci., Ser. 4, **11** (10): 11–144. 1921.

ELECTIONS TO THE WASHINGTON ACADEMY OF SCIENCES (1955, 1956)

(Resident members unless otherwise indicated)

January 18, 1955

MAXWELL KENNETH CARRON, in recognition of his contributions to geochemistry and analytical chemistry.

ROBERT FRANKLIN DRESSLER, in recognition of his original contributions to applied mathematics, particularly in elasticity, aerodynamics, and hydraulics.

RICHARD HERBERT FOOTE, in recognition of his contribution to the taxonomy of Diptera, particularly of the blood-sucking species.

JOHN PETER HAGEN, in recognition of his outstanding research in solar and galactic physics by means of the methods of radio astronomy.

EDWARD WILLIAM HAWTHORNE, in recognition of his work on renal physiology.

JOHN DRAKE HOFFMAN, in recognition of his contributions to the physical chemistry of long chain compounds and in particular his researches in the theory of dielectrics.

JEROME NAMIAS, in recognition of his outstanding work in developing methods of extended weather forecasting and his leadership in research in synoptic meteorology research.

ROLAND M. NARDONE, in recognition of his research on the metabolism of Protozoa.

LAURA E. REICHEN, in recognition of her research work on methods for determining trace elements and her contributions to chemical mineralogy.

CULBERTSON WHITFIELD ROSS, in recognition of his work on the structural behavior of masonry and reinforced concrete structures and of clay building brick and for his work on the design of shore structures subject to wave attack.

FRANK LESTER ROTH, in recognition of his contributions to the physics and technology of rubber and in particular his researches on stress-strain-time relations, including his part in the development of the strain tester.

ROBERT HOMER SIMPSON, in recognition of his original work in research in tropical meteorology and the structure of hurricanes.

CHARLES VICTOR STRAIN, in recognition of his significant contributions to nuclear physics, particularly in specialized aspects of atomic energy.

WILLIAM ALBERT ZISMAN, in recognition of his contributions to the field of surface chemistry, in particular his work on adsorbed layers, and the discovery of means of preparing oleophobic monolayers.

February 15, 1955

CHARLES A. DOUGLAS, in recognition of his contributions in the field of atmospheric transmissometry.

SAMUEL NEWTON FONER, in recognition of his contributions in mass spectrometry and in particular his study of free radicals using mass spectrometric techniques.

ROBERT BOYD HOBBS, in recognition of his contributions to leather and paper research and technology, and in particular his researches on instrumentation and techniques for evaluating the properties of these materials and products made from them.

JOE THOMAS MASSEY, in recognition of his contributions to microwave spectroscopy, particularly to the study of the internal rotation of the hydrogen peroxide molecule.

ROBERT JOSHUA RUBIN, in recognition of his research work in chemical physics and in particular his contributions to an understanding of the exuded volume problems.

KURT EGON SHULER, in recognition of his contribution to chemical physics and in particular his studies of reaction kinetics in flames.

SIEGFRIED FRED SINGER, in recognition of his researches on cosmic-ray physics, the physics of the upper atmosphere, and his contributions to a better understanding of the age of meteorites.

ZAKA I. SLAWSKY, in recognition of his researches on hyperballistics and his contributions to a better understanding of the effect of molecular forces in very dense gases.

HARRELL LEROY STRIMPLE, in recognition of his contributions to paleontology, and in particular his researches on Paleozoic Echinodermata. (Nonresident.)

April 19, 1955

THOMAS WILLIAM AMSDEN, in recognition of his work on Silurian fauna of Tennessee and Silurian brachiopods of Tennessee, Oklahoma, and Alaska. (Nonresident.)

CHARLES SHERRILL GILMAN, in recognition of his scientific attainments as shown by his published papers and his independence of thought in scientific matters and activities in meteorological research and development.

ALAN JEROME HOFFMAN, in recognition of his contributions to mathematics, in particular to the new field of linear programming, of which he is one of the principal representatives in this area, and to numerical analysis.

KERMIT WILLIAM KREITLOW, in recognition of his contributions to plant pathology and in particular his research on rusts, smuts, and other diseases of forage crops.

IRVING MAY, in recognition of his contributions to our knowledge of fluorimetric methods for the quantitative determination of small percentages of uranium and thorium in rocks and minerals.

REES FERNEAU TENER, in recognition of his contribution to the advancement of rubber technology and to the development of methods of test and specifications for organic and fibrous materials.

ARNOLD WEXLER, in recognition of his contributions to techniques of humidity measurements by precise means in the laboratory and by less precise but quick responding elements in the upper air.

May 17, 1955

G. GILBERT ASHWELL, in recognition of the discovery of two new 5-carbon sugars revealed in studies of carbohydrate metabolism in spleen extracts, one of which had been postulated in photosynthetic reactions.

JEROME CORNFIELD, in recognition of his contribution to the theory of the probit method and his application of statistical methods to experimental biology and medicine, especially to smoking and lung cancer, bioassay of endocrine products, and photosynthesis.

HAROLD F. DORN, in recognition of his studies of the distribution of cancer in human populations and the effect of public health measures upon population growth, by statistical and epidemiological methods.

PETER HERMAN HEINZE, in recognition of his work on the physiology of fruits and vegetables and its relationship to their quality and nutritional value, for his studies on photoperiodic responses of plants and plant organs, and for his contributions in the chemical analysis of plant tissues.

EDWARD FRED KNIPLING, in recognition of his contributions to basic and applied research and to the direction of research on the biology, taxonomy, and control of insects and other arthropods that affect man and animals.

OSCAR THEODORE MARZKE, in recognition of his services to the field of metallurgy, especially his able direction of industrial research resulting in improved products and also the direction of fundamental research in government laboratories.

DEWITT STETTEN, JR., in recognition of studies on the metabolism of fats and carbohydrates, particularly as related to metabolic diseases.

June 14, 1955

ALLEN L. ALEXANDER, in recognition of his contributions to the protective coatings field, in particular his studies of the relationship between toxic pigment and organic binder in antifouling paints.

L. L. ASHBURN, in recognition of his studies on sulfonamide agranulocytosis, for recognition of the cardiac lesions characteristic of thiamin deficiency in rats, and for clearly differentiating the anatomical sequence of events in liver cirrhosis.

GEORGE BRECHER, in recognition of his discovery and study of gold thioglucose obesity, for numerous studies on histopathology and hematology of radiation damage, and for studies on parabiosis and transfusion effects in irradiated animals.

JOSEPH J. BUNIM, in recognition of his contributions to the diagnosis and treatment of collagen diseases and definitive studies of endocrine effects in experimental animals and man.

FRANCIS EUGENE CLARK, in recognition of contributions to soil microbiology (particularly to the microflora of plant roots, to the ecology of soil-borne root-rotting parasites), to the anaerobic and aerobic sporulating bacilli and to the soil corynebacteria, and to soil biology in relation to soil nitrogen and soil organic phosphorus.

NATHAN B. EDDY, in recognition of his scientific contributions to the field of narcotics and analgesics and international leadership in activities relating to the study of drug addiction.

HEWITT G. FLETCHER, JR., in recognition of his contributions in the field of ribose chemistry, particularly the recent elucidation of the carbohydrate moiety in stevioside.

ROBERT AVERY FULTON, in recognition of his contributions on materials, methods, and equipment for the chemical control of insects.

PETER HIDNERT, in recognition of his contributions in the field of thermal expansion of metals, alloys, and other materials.

JOHN C. KERESZTESY, in recognition of his

contributions toward the isolation and identification of the B vitamins and his extensive studies on the action and chemistry of the citrovorum factor.

KOLOMAN LAKI, in recognition of his studies in protein chemistry and structure, particularly as related to contraction and coagulation.

ERIC MOSETTIG, in recognition of his contributions in the field of alkaloid and medicinal chemistry, activities in the antimalarial program, and structural elucidation and rearrangements of certain anthracene compounds.

HAROLD R. SANDSTEAD, in recognition of his studies on human starvation and his appraisal of nutritional status and formulation of nutrition programs under various conditions in many parts of the world.

ABRAHAM M. SHANES, in recognition of his studies on electrical phenomena in nerve, ionic transfer, and effects of electrolytes and drugs on nerve transmission.

CURTIS R. SINGLETERRY, in recognition of his contribution to colloid science, in particular the study of soap micelles in nonaqueous systems.

RUSSELL BRADFORD STEVENS, in recognition of his contributions to mycology and plant pathology, especially on approaches and concepts useful in teaching these subjects.

BERNHARD WITKOP, in recognition of his contributions to the chemistry of amino acids through work with labile metabolites, and particularly for recent studies on the biochemical transformations of tryptophan to various metabolites of physiological and pathological importance.

July 27, 1955

ROBERT COHN, in recognition of his pioneer development of electroencephalography and particularly for his critical studies of physiological and pathological correlates with electroencephalogram.

KENNETH STEWART COLE, in recognition of his outstanding work in biophysics, particularly his measurements of impedance in nerve and the changes of this factor with nerve activity.

THEODORE ROOSEVELT GARDNER, in recognition of his contributions to the biological control of insect pests, particularly his work on the introduction of parasites from various foreign countries into the United States, and on fundamental studies of the parasites themselves.

WARREN ELLIOTT HENRY, in recognition of his contributions to solid-state physics and in particular his researches on magnetic interaction between atoms.

URNER LIDDEL, in recognition of his fundamental work with infrared, especially studies on hydrogen bonding and molecular condition of water, his development of practical uses of infrared in industrial chemistry, and his optical research and development for the Navy.

JOHN CUNNINGHAM LILLY, in recognition of his outstanding work in biophysics and physiology; has devised a nitrogen meter and a capacitance manometer which are widely used in studies of respiration and circulation and made important contributions to physiology of cerebral cortex.

FRANK MATOSSI, in recognition of his contributions to molecular spectroscopy, in particular infrared and Raman spectra of solids and electroluminescence.

MANUEL F. MORALES, in recognition of his outstanding work in physical chemistry of biological systems and his work in mathematics of biological processes.

WILBUR TIBBILS PENTZER, in recognition of his research on physiological changes in fruits and vegetables during maturation and on the biological aspects, refrigeration, storage, and transportation of these agricultural products.

THEODORE PETER PERROS, in recognition of his contributions to inorganic chemistry, particularly the chemistry of rare earths and other less familiar elements.

ICHIJI TASAKI, in recognition of his outstanding work in biophysics and physiology. He is generally recognized as one of the world's leading authorities and as one of the most brilliant researchers in the field of neurophysiology.

ROALD KLINKENBERG WANGSNESS, in recognition of his work on the theories of nuclear and ferromagnetic resonance.

November 15, 1955

JOSHUA ROBERT CALLOWAY BROWN, in recognition of his contributions in acarology on the histology and mechanism of feeding of trombiculid mites, and his investigations in cytology on the isolation and characterization of cell particulates from tissue homogenates.

JACOB MARTIN LUTZ, in recognition of his work in postharvest horticulture.

ROBERT HALE NELSON, in recognition of his contributions to economic entomology, particularly his work on the control of the gladiolus thrips and on the relative toxicity of synthetic organic insecticides.

MARGARET E. PATTERSON, in recognition of outstanding accomplishments in the discovery and encouragement of science talent.

SARAH ELIZABETH STEWART, in recognition of her earlier contributions on the toxins and toxoids of the gas gangrene bacteria, and for

her present contributions on neoplasms in mice inoculated with cell-free extracts or filtrates of leukemic mouse tissues.

January 17, 1956

WILLIAM JOHN BAILEY, in recognition of his work in organic chemistry; in particular his investigations on the organic chemistry of high polymers.

JOHN SHERRARD COLEMAN, in recognition of his contributions to under-water acoustics and high-speed electronic counters as well as his services as editor and principal contributor to the technical reports of NDRC on subsurface warfare.

GEORGE P. CRESSMAN, in recognition of his basic contributions to the motions of planetary waves in the atmosphere and his leadership in application of numerical weather forecasting.

GEOFFREY EDSALL, in recognition of his contributions to immunology, particularly his outstanding studies in the immunological responses to diphtheria and tetanus toxoids and typhoid vaccine and the use of blood and blood fractions in public health.

RICHARD ALLAN FERRELL, in recognition of his important contributions to several fields of theoretical physics including the first interpretation of the fine structure of positronium, his contributions to the understanding of effects of electron correlation on various solid state problems, and his work with W. M. Visscher, giving a possible explanation to the anomalously long lifetime of carbon-14.

JOHN RODERICK HELLER, Jr., in recognition of his extensive studies and services in the field of public health, particularly concerning venereal diseases and cancer, and for his direction and administration of Federal cancer research programs.

ISIDOR HELLER, in recognition of his work in the field of mathematics, particularly as applied to logistics problems.

WOODROW C. JACOBS, in recognition of his contributions to the understanding of the energy budget of the oceans and his application of the science of climatology to practical problems.

HELMUT E. LANDSBERG, in recognition of his basic contribution to the sciences of seismology, meteorology, and climatology and his organizing ability and leadership in the geophysical sciences.

ELLIS R. LIPPINCOTT, in recognition of his work in physical chemistry, in particular for his researches in infrared and Raman spectroscopy and related fields.

EDWARD A. MASON, in recognition of his work in molecular physics and in particular for his work on intermolecular potentials for nonpolar molecules.

RALPH DUANE MYERS, in recognition of his contributions to the theory of nuclear reactions and to solid state theory. He has been principally responsible for the development of the active graduate program in physics at the University of Maryland. His Ph.D. thesis includes the first development of the group-theoretic treatment of nuclear reactions.

WILLIAM FREDERICK SAGER, in recognition of his studies of oxidation-reduction reaction in general, and particularly in organic chemistry.

LEO SCHUBERT, in recognition of his contributions to a better understanding of inorganic and analytic chemistry through his work on complex ions and fluorometric analysis.

JACK COATS THOMPSON, in recognition of his application of basic laws of meteorology and probability of weather forecasting.

PHILIP DUNCAN THOMPSON, in recognition of his contributions to the application of numerical analysis to the theory of large-scale disturbances in the atmosphere.

JOHN SAMPSON TOLL, in recognition of his contributions to the theory of scattering and to quantum field theory.

March 20, 1956

JOHANNES MARTINUS BURGERS, in recognition of his outstanding contributions to physics, particularly to fluid dynamics and rheology.

JOHN IRVIN HOOVER, in recognition of his significant contributions to nuclear physics, and especially to reactor physics. He was largely instrumental in demonstrating the low neutron cross-section of zirconium, which makes this element extremely important for fission reactors. He has served as a highly effective leader of the radioactivity branch of the Nucleonics Division, Naval Research Laboratory.

ISAO IMAI, in recognition of his contributions to aerodynamics, particularly to the theory of two-dimensional compressible flows. (Non-resident.)

ROBERT JASTROW, in recognition of his outstanding contributions to nuclear theory, notably the Jastrow hadcore model of the nucleus, and his stimulating influence on his colleagues, both in theory and experiment.

JOSEPH KAPLAN, in recognition of his contributions to geophysical sciences, and in particular his important research on upper-atmosphere physics.

ROMAN RODNEY MILLER, in recognition of

his contributions to the technology of liquid metals, and in particular for his investigations of the thermodynamic properties of alkali metal systems at high temperature.

MARCEL RIESZ, in recognition of his contributions to mathematics, particularly to the study of the wave equation. (Nonresident.)

RAMOND CLIFFORD WADDEL, in recognition of his many scientific contributions, notably those in electronics research. In addition. Dr. Waddel has been an indispensable collaborator in, and frequently leader of, a wide range of investigations at the Naval Research Laboratory, some of high importance to the U. S. Navy. His current services as consultant to the Nucleonics Division of the Naval Research Laboratory are distinguished and invaluable.

ROBERT T. WEBBER, in recognition of his original contributions to theory and understanding in the field of solid-state physics, especially in the interpretation of transport phenomena in metals; and he has been very active in the development of research of cryogenics.

JOHN WILLIAM WRENCH, Jr., in recognition of his research in the field of numerical analysis.

Elected May 15, 1956

PHILIP J. DAVIS, in recognition of his work in approximation theory and functional analysis.

FREEMAN KENNETH HILL, in recognition of his contributions to fluid dynamics, in particular to the experimental study of hypersonic flow.

DALE WILSON JENKINS, in recognition of research contributions in field of medical entomology, particularly acarology, mosquito biology, and research on radioisotopes in biology and entomology.

MORRIS NEWMAN, in recognition of his contributions to mathematics, in particular the theory of numbers and the exploitation of automatic computers in that field.

EDWIN WOODS ROEDDER, in recognition of his work in the study of silicate equilibria and its application to geological and industrial problems.

JACK T. SPENCER, in recognition of his contributions to the improvement of pasture and meadow grasses.

HARLAN NOYES WORTHLEY, in recognition of his contributions to the chemical control of deciduous fruit insects and his administrative contributions to the strengthening of national defense in chemical and biological warfare.

June 19, 1956

HARRY C. ALLEN, Jr., in recognition of outstanding work in the analysis of molecular spectra and the determination of molecular constants.

ERNEST AMBLER, in recognition of his contributions to solid-state physics, in particular his researches on nuclear alignment at very low temperatures and contributions to magnetic research.

ARNOLD M. BASS, in recognition of his contributions to molecular physics, and in particular his measurements on new molecular bands at very high and at very low temperatures.

CHARLES W. BECKETT, in recognition of his contributions to our knowledge of molecular structure and thermodynamic properties of hydrocarbons, and compounds of titanium, boron, fluorine, and deuterium.

LOUIS M. BRANSCOMB, in recognition of work leading to the first successful observation of the photodetachment of negative ions under laboratory conditions.

WILLIAM S. CONNOR, Jr., in recognition of substantial contributions to the design of experiments, in particular the theory of paired comparisons.

HANS P. R. FREDERIKSE, in recognition of his contributions to low temperature physics, in particular adsorption of helium; and to solid-state physics, in particular his work on germanium and on intermetallic compounds.

ABRAHAM S. FRIEDMAN, in recognition of his contribution to thermodynamics, in particular the experimental investigation, theoretical calculation, and compilation of the properties of deuterium compounds.

MELVILLE S. GREEN, in recognition of his contributions in the field of quantum and statistical mechanics and in particular his studies of the theory of irreversible processes.

CHARLES M. HERZFELD, in recognition of his contributions in solid-state theory, and in particular his interpretations of crystal field effects on atomic nitrogen.

RALPH P. HUDSON, in recognition of his contribution to cryogenic physics, and in particular his researches in magnetic thermometry leading to the improvement of standards in this field.

KARL G. KESSLER, in recognition of his contributions to the field of spectroscopy.

HERMANN HERBERT KURZWEG, in recognition of his research work in supersonic aerodynamics and aerodynamic development of long-range rockets.

THOMAS R. MCGUIRE, in recognition of his contribution to the field of magnetism through his work on paramagnetic susceptibility of metals and ferrimagnetic material; and on elec-

tronic microwave magnetic resonance of antiferromagnetics and ferromagnetics.

October 16, 1956

HENRY A. ANTOSIEWICZ, in recognition of his work in the stability theory of ordinary nonlinear differential equations.

THOMAS B. DOUGLAS, in recognition of his valuable contributions in the field of high-temperature thermodynamics, specifically in the accurate measurements of heat capacity and enthalpy.

WILLIAM S. RODNEY, in recognition of his contribution in the field of high precision measurements of refractive index of halide crystals and other transparent media, particularly in the infrared region of the spectrum.

IRENE A. STEGUN, in recognition of outstanding work in the organization, direction, and execution of consulting services in numerical analysis and computational methods for research and development groups in many scientific (and military) areas, and valuable personal contributions to the world's library of mathematical tables.

DAVID WATSTEIN, in recognition of distinguished work and authorship in the field of structural engineering, and in particular for his researches on reinforced concrete and masonry.

LEROY L. WYMAN, Sr., in recognition of his contributions to physical metallurgy, metallography, and X-ray diffraction, particularly in connection with powder metallurgy, tungsten and cemented carbides, copper oxidation, and alloy studies.

November 27, 1956

DEAN BURK, in recognition of his many outstanding contributions to the fields of plant physiology and cancer metabolism, in particular those relating to nitrogen fixation, quantum efficiency of photosynthesis, and metabolic characteristics of normal and neoplastic cells.

ULYSSES S. GRANT, III, in recognition of his contributions in civil and military engineering, and in particular his distinguished work in conserving the beauty of the country as a member of the National Park and Planning Commission.

GEORGE H. HICKOX, in recognition of his contributions to our research knowledge in the field of hydraulic engineering, especially in the fields of cavitation, scaling laws, and friction coefficients.

LOUIS LEVIN, in recognition of his contributions to biochemistry and physiology of endocrine function, particularly to structure and mode of action of estrogenic substances, purification and characterization of gonadotrophins, and metabolic effects of pituitary and adrenal hormones.

HENRY EMMONS ROBINSON, in recognition of contributions to knowledge of thermal insulating means for buildings, including air spaces with reflective (metal foil) surfaces; also conductivities of metals and other solids.

JAMES F. SWINDELLS, in recognition of his work in rheology and in particular for the completion of the accurate determination of the viscosity of water leading to the adoption of this water value as the international standard.

December 18, 1956

THOMAS GAYLORD ANDREWS, in recognition of research contributions in experimental psychology and psychometric methods and his research administration.

WILLIAM E. BICKLEY, in recognition of his work in the field of insect morphology and taxonomy and medical entomology.

KARL FRANK, in recognition of his studies of the central nervous system by intracellular and intrafiber electrical measurements. His work has resulted in important contributions to knowledge of nerve cell activity and synaptic transmission.

PHYLLIS TRUTH JOHNSON, in recognition of outstanding contributions to the control of vector-borne diseases through systematic and ecological studies of the vectors and transmission studies of viruses and rickettsiae.

ALEXANDER F. ROBERTSON, in recognition of achievements in fire research, especially his applications of principles of modern physics to solutions of problems on the fire resistance of structures, the flammability of finishes, and the extinguishment of fires.

HENRY WILLIAM SCHOENBORN, in recognition of his studies on the physiology of Protozoa.

ARTHUR JAMES SHANAHAN, in recognition of his contributions to microbiology, particularly on morphology and effects of antibiotics.

SAMUEL ZERFOSS, in recognition of his work on growth of single crystals.

PROCEEDINGS OF THE ACADEMY

477TH MEETING OF BOARD OF MANAGERS

The 477th meeting of the Board of Managers, held in the Tayloe Room of the Cosmos Club, January 18, 1955, was called to order by the President.

Dr. McPherson, chairman of the Committee on Encouragement of Science Talent, reported that the visit of the Junior Academy to the Franklin Institute in Philadelphia was a great success. Because of the excellent coverage given the trip by the *Washington Post-Times Herald*, the Secretary was instructed to write a letter of appreciation to the editor.

Dr. McPherson also proposed a new standing Committee on School Contacts and outlined its functions. After discussion it was referred to the Committee on Policy and Planning for further consideration.

The Secretary reported the death of A. O. Leuschner on April 22, 1953, and of Frances E. Fox on December 29, 1953.

Qualifications for the retired list were discussed. The question was referred to the Committee on Policy and Planning for recommendation or for reinterpretation of Article II, Section 2, paragraph 2, of the Bylaws.

President Defandorf thanked the members of the Board for their cooperation throughout the year. After the meeting adjourned, refreshments were served by courtesy of the retiring President.

MEETING OF EXECUTIVE COMMITTEE

A meeting of the Executive Committee of the Board of Managers was held on February 1, 1955, at which a tentative budget for the year was presented by the Treasurer.

A discussion of the effect of implementing the recommendations of the Committee on Improvement of the Journal was held. Dr. Cook cited a letter from the Waverly Press to Mr. Oehser indicating that printing rates would increase about 4.23 percent in 1955. A discussion of methods for meeting publication costs of the Journal followed. Suggested alternatives to increased charges were to omit alternate issues or to solicit advertising. Mr. Rappleye's estimate for the Journal was accepted for presentation to the Board of Managers.

Nominations for Editor and Associate Editors for the Journal were considered. Dr. Pittman was to contact those selected and to present their views at an executive meeting prior to the next meeting of the Board of Managers.

The revision of the Red Book was postponed until 1956.

478TH MEETING OF BOARD OF MANAGERS

The 478th meeting of the Board of Managers, held in the Tayloe Room of the Cosmos Club, February 15, 1955, was called to order by the President.

Dr. Pittman reported on the Executive Committee meeting, indicating that progress in considering several nominees for Editor has been made, but that final recommendations had not been completed.

Dr. Scott, chairman of the Committee on Meetings, reported that the address of the retiring President, Dr. Defandorf, would be given at the February meeting, that presentations by the recipients of Academy awards would be given at the March meeting, and that the April meeting would be held jointly with the Junior Academy.

Dr. Curtis reported an organization meeting of the Committe on Membership.

Chairman Poos, of the Committee on Awards for Scientific Achievement, asked the Board to consider giving more awards, saying that current categories are too broad. He reported that during the past year at least five or more nominations in each area seemed equally eligible to the Committee. Dr. Frenkiel spoke in favor of more awards, especially in physical sciences, but felt that additions should be quite limited. Dr. Pittman asked the Policy and Planning Committee, through Dr. Crittenden, chairman, to consider this matter.

Dr. Crittenden called attention to the fact that there were AAAS honorary memberships for high-school students to be nominated through the Academy and the Junior Academy. He was instructed to check this matter with Dr. A. T. McPherson.

In the absence of committee action on questions arising at the last Board meeting with regard to the remission of dues for certain members, Dr. Crittenden's letter of January 10, 1955, was filed outlining certain evidence to be considered in these cases.

Chairman McPherson, of the Committee on Encouragement of Science Talent, called on Dr. Mebs to describe a meeting of Drs. Mebs, Snelling, and Read at the Bladensburg Senior High School with the junior class on Career Day. Dr. McPherson urged again that the vice-presidents of the affiliated societies produce more contributions from them to support the science field. He also announced the Westinghouse trip winners' exhibition.

Secretary Specht reported on a survey of the financial status of State academies and similar groups in the United States which was presented at the AAAS meeting in Berkeley, Calif. The Treasurer and the chairman of the Grants-in-Aid Committee asked to see the report, which was turned over to the Treasurer. Payment to the Cosmos Club for use of the rooms for meetings was discussed and referred to Dr. Defandorf and Dr. Gibson for final disposition.

The Treasurer reported the death of Theodore Lyman in October 1954. Approval was given to the placing of the following members on the retired list: Raymond L. Sanford, H. Freeborn Johnson, H. D. Miser, and M. A. McCall.

Mr. Rappleye then submitted the following

budget for 1955, which the Board unanimously approved:

	1954	1955 (est.) (Esti.)
Receipts		
Dues	$4,729.17	$4,800.00
Journal subscriptions	1,714.50	1,800.00
Sales	532.68	150.00
Interest and dividends	2,087.70	2,000.00
	$9,064.05	$8,750.00
Disbursements		
Journal and Journal Office	$6,536.79*	$6,900.00*
Secretary's Office	747.21	600.00
Treasurer's Office	204.98	200.00
Meetings Committee	504.09	500.00
Membership Committee	—	15.00
Archivist	—	10.00
Custodian and Subscription Manager	21.67	50.00
Committee on Encouragement of Science Talent	45.90	50.00
Committee on Science Education	17.11	50.00
Science Fair	300.00†	300.00
Science Calendar	75.00	75.00
	$8,453.35	$8,750.00

* Plus charges to authors.
† Budget amount.

Dr. Pittman introduced a letter from Dr. Frenkiel proposing the creation of ex-officio members, specifically, the elected Chief Executive of the District of Columbia, the School Superintendents, and similar individuals in private and parochial schools. This matter was referred to the Committee on Policy and Planning.

Dr. Hess inquired as to policy regarding the Journal. A discussion and amplification of the report by Dr. Campbell for his committee followed.

479TH MEETING OF BOARD OF MANAGERS

The 479th meeting of the Board of Managers, held in the Tayloe Room of the Cosmos Club, March 15, 1955, was called to order by the President.

Dr. Scott reported that in connection with a display of their projects, two Westinghouse winners were to give 5-minute talks at the April meeting. It was announced that the May meeting would be held jointly with the Meteorological Society.

The Committee on Policy and Planning reported through Chairman Crittenden on five topics assigned to it. In connection with item 1, Dr. McPherson moved that the President be authorized to call a meeting of the key people of societies and other groups interested in science education for the purpose of developing a unified plan. This was unanimously approved.

Dr. Walton spoke on the need to be able to "deliver the goods" in dealing with schools and to have a working list of people who can give practical assistance as speakers, science counsellors, or consultants on science projects. Dr. McPherson spoke of the Wheaton area where students were being supervised by a team of local scientists under the leadership of Dr. Lashof and Mrs. Roger M. Wilson. Dr. McPherson suggested that school contacts could be handled in a joint committee with other scientific organizations.

In response to item 1C (teachers' salaries), Dr. Gurney asked whether there was any differential with regard to teaching field. Dr. Mebs asked if it would help to stress that industry pays a premium to trained teachers which attracts them away from teaching. Dr. Frenkiel suggested that a way to remind the public of this and to help hold teachers in the area would be to organize summer employment for teachers in various government laboratories. Dr. Mebs noted that Newark holds its science teachers by an arrangement for summer jobs in the Libbey Owens Glass Works. Dr. Walton surmised that this plan might result in defections by teachers wishing to continue their summer work as permanent work.

Dr. Gurney's motion to follow the recommendations of the Committee in item 2 was carried.

Item 3 called for changes in the standing rules of the Board of Managers concerning the selection of candidates for awards. A motion to accept the changes as recommended was tabled for the present.

Item 4 dealt with relief from dues on retirement. A number of fiscal questions were raised, and this part of the report was referred to the Treasurer for further study.

Item 5 was referred to the committees concerned: Ways and Means and Improvement of Publications.

A copy of the report made by the Committee on Encouragement of Science Talent, together with a list of the 16 high-school seniors* selected out of 75–100 applicants for awards, was turned over to the President. Dr. McPherson's motion that the awards be made was approved. Dr. McPherson's further motion that Miss Margaret Patterson be especially awarded for her contribution to the recognition and encouragement of science talent, particularly for her activities in connection with the Junior Academy of Sciences, was carried unanimously.

The Secretary presented Orland E. White's request for retirement, which was approved.

The Secretary also reported an inquiry from Henry H. Armsby regarding the policy of the Committee on Grants-in-Aid regarding high-school students. Until now, grants have been made only to individual, mature investigators. The President referred this matter to the Committee on Grants-in-Aid for research.

The Treasurer reported a donation of $100 for the Science Fair from Dr. Francis B. Silsbee, representing his honorarium for participation in examination of the papers of contestants in the 14th National Science Talent Search for the Westinghouse Science Scholarships. The Secretary was directed to send him a letter of appreciation.

* This JOURNAL **45**: 163. May 1955

480TH MEETING OF BOARD OF MANAGERS

The 480th meeting of the Board of Managers, held in the Tayloe Room of the Cosmos Club, April 19, 1955, was called to order by the President.

The Secretary reported the nomination of Dr. Chester H. Page as Editor of the Journal. He was unanimously elected, to begin his editorship with the January 1956 number.

Dr. Frenkiel reported that the Membership Committee had met at the offices of Science Service and found it to be a suitable place for the purpose. For assistance in establishing criteria for nominees in the social sciences, the Committee was advised to consult Dr. Leonard Carmichael.

Chairman Cooper of the Committee on Monographs requested instructions on monograph publication, the Academy's first monograph being still in considerable supply. Dr. Gurney and Mr. Rappleye commented that the issuance of a new monograph should not necessarily depend on the sale of the prior monograph. Dr. Gurney pointed out that the experience of the Chemical Society was that the salability of monographs seemed to increase with the number of monographs undertaken, that certain salability criteria should be considered, and that perhaps an alternation of salable with less salable material would ease the financing problems of publication.

Chairman McPherson reported for the Committee on Encouragement of Science Talent that $50 had been received from Paul Lichman for the Science Fair and that half the expense of the souvenir program which had been prepared could be borne by the Junior Academy. Mr. Dill moved that the Academy assume the whole expense, and it was decided that this should be borne by the Committee on Meetings. Dr. Scott pointed out that provision should be made in the future for budgeting such items.

Mr. Keith Johnson reported that the Junior Academy would have an executive session to which all members of the Academy were invited. He then discussed some of the selection problems and complications which arose in connection with the Washington Science Fair. He emphasized that arranging for a fair is becoming more and more difficult and that the coordination of fairs in Montgomery, Arlington, and Prince Georges Counties and the District of Columbia is becoming imperative. He spoke of the lack of a sponsor to send the two winners and accompanying teacher to the National Fair at Cleveland. Considerable discussion centered on the cost of such sponsorship, Dr. Gurney pointing out the economies of automobile transportation and of modest lodging arrangements.

The Secretary read a letter to the President from Dr. Sherman Ross of the University of Maryland regarding the prospects of affiliating a contemplated society of human engineering with the Academy. President Pittman noted that this request was in the area of scientific interest mentioned earlier by Dr. Frenkiel and that it would be handled by the Committee on Policy and Planning.

The Treasurer laid before the board a request from the Massachusetts Investors Trust for permission to reveal the names of shareholders to prospective investors who inquire about the type of institutions holding shares. In the opinion of the Treasurer, no objection should be made because such information is already a matter of public record. He was instructed to reply favorably to the request and to ask that such information not be used in direct advertisement.

Dr. Cook, of the Board of Editors, reported that the April issue of the Journal would contain a column of Washington news of scientific interest, that subsequent journals would carry a column of letters to the Editor or short papers somewhat in the nature of articles appearing in the "Comptes Rendus." Dr. Frenkiel remarked on the continued need for a strong editorial authority and a stated policy with regard to the content of the Journal.

481ST MEETING OF BOARD OF MANAGERS

The 481st meeting of the Board of Managers, held in the Tayloe Room of the Cosmos Club, May 17, 1955, was called to order by the President.

The Executive Committee met prior to the Board meeting and discussed with the Editor (a) the nomination of assistant editors and (b) the possible actions in response to a more than 600 percent increase in charges for reprints by the Waverly Press, printers of the Journal.

Dr. Curtis reported on points of concern to the Membership Committee. It was decided that the two policy problems he brought up (the modus operandi for nomination of honorary members and the need for a class of membership to be added to the Bylaws in Article II, Section I, to cover those having "outstanding achievement in science education") should be taken up by the Committee on Policy and Planning.

Chairman Rice, of the Committee on Grants-in-Aid for Research, reported that universities and colleges within a 25-mile radius of the Capital had been notified of the availability of the grants-in-aid fund, but to date only two applications have been received. It was recommended that Dr. Burkey advise the Committee about the application which is in his field.

Dr. McPherson made a special report of the activities of his Committee on Encouragement of Science Talent, the main features of which were the presentation of certificates of merit to 16 students and of a special award to Miss Margaret Patterson of Science Service; the great success of the Science Fair, for which almost twice as many exhibits were submitted as could be accommodated; and the sending of two students to the National Science Fair in Cleveland. The students were Joel F. Lubar, of Montgomery Blair High School, and Betty Marie Coder, of Northwestern High School. The latter received special recognition at the National Fair.

Officers elected at the final meeting of the

Junior Academy were: President, Robert Menzer; Vice President, Barbara Reason; Secretary, Robert Moore; Treasurer, Charles Gray; Councillors, Stewart Lichman, Margaret Mix and Diana Banks; Alumni Councillors, Mr. and Mrs. Charles L. Kimbell and Ernest Lum.

Dr. McPherson then nominated Robert Edward Ambrose and Betty Marie Coder to membership in the AAAS. Unanimously approved. Mr. Keith Johnson, present at the meeting by invitation, promised to furnish a full financial report on the fair. He estimated the total cost of the fair at something over $1,400, the transportation to the National Fair coming to $460.

In connection with plans to cooperate with local teachers during the annual meeting of the National Science Teachers Association, to be held in Washington this year, Dr. Frenkiel suggested that there should be an affiliation of some teachers' association, perhaps this one as well as others, with the Academy. Dr. Watson remarked that some teachers are already members of certain of the affiliated societies, particularly the Philosophical Society.

Dr. Seeger, of the Committee on Science Education, reported prospective meetings of teachers at various levels in biology, mathematics, and physics. This type of meeting he called "vertical" as contrasted with "horizontal" meetings such as conferences of all teachers at a certain grade or within certain grade levels. He also reported planned meetings with the students of Maryland State Teachers College and a meeting he had with Friends School science students regarding science careers.

Mr. Rappleye, Treasurer, reported that it has been decided that he will receive, immediately after the general mailing of the Journal, all "over copies" and will keep them to issue to new members on request for a period slightly in excess of one year and then transfer them to Dr. Rehder for the normal issuance of back numbers.

The President read the proposed changes in the Bylaws regarding the duties of the Committee on Awards for Scientific Achievement as recommended by the Committee on Policy and Planning:

Standing Rules of the Board of Managers, Item 8:

It shall be the duty of the COMMITTEE ON AWARDS FOR SCIENTIFIC ACHIEVEMENT to recommend one or more candidates each for the Biological Sciences, the Engineering Sciences, the Physical Sciences, and for the Teaching of Science. A candidate must reside within 25 miles of Washington, and except for an award for the Teaching of Science shall not have passed the 40th anniversary of the date of his birth by the end of the calendar year for which the award is made; recommendations by the committee must reach the Board of Managers not later than the meeting immediately preceding the annual meeting of the Academy in January. Each recommendation to the Board must be accompanied by a written suporting statement giving the necessary information concerning the candidate, together with a citation covering not over 80 spaces, as "in recognition of his distinguished service in . . . (80 spaces) . . ."

There was a discussion as to how to handle the intention to make only a limited increase in the presentation of awards. It was agreed that no limiting statement be placed in the Bylaws, but that the consensus of the Board and the Committee be made available through the meetings.

Mr. Rappleye reported on the amendment of Article II, Section 2, of the Bylaws with regard to retired members. His motion that the amendment state that "the price of the Journal to retired members shall be one-half the price to nonmembers" and that "nothing in this paragraph shall operate to change the status of members of the Academy who have already been placed on the list of retired members" was approved. It was agreed that both these matters will be placed on ballots in the fall for the general membership vote.

President Pittman dissolved the Committee on Improvement of the Journal with a statement of thanks to Chairman Campbell and committee for its work. She pointed out that the remaining problems were largely ways and means, for which she would appoint another committee. The President noted that another Board meeting must be held to vote on the election of members nominated at this meeting. The date of June 14 was set.

482D MEETING OF BOARD OF MANAGERS

The 482d meeting of the Board of Managers, held in the Tayloe Room of the Cosmos Club, June 14, 1955, was called to order by the President.

Dr. Pittman announced the appointment of F. N. Frenkiel, chairman, F. M. Defandorf, Paul H. Oehser, and B. F. Scribner to the special Committee on Ways and Means of Improving the Activities of the Academy.

The Executive Committee nominated as Associate Editors for the Journal Dr. Howard W. Bond (Chemistry) and Dr. I. Estermann (Physics), who were unanimously elected.

Dr. Curtis, chairman of the Committee on Membership, presented a list of 14 individuals for first reading. Dr. McPherson remarked that the average age of these nominees was over 40 years in contrast to recent nominees, and Dr. Frenkiel pointed out that this indicated that eligible men had been available for prior nomination by the previous committees. Dr. Scott noted that the balance of fields was still in favor of physics-mathematics, with biological fields a close second. Dr. Curtis asked for the sentiment of the Board regarding the age level, and Dr. Frenkiel expressed the opinion that eligible young members should still be sought.

The Secretary read a communication from Chairman Rice, of the Committee on Grants-in-Aid for Research, recommending a $200 grant to Allen F. Woodhour, of Catholic University.* Unanimously approved. Dr. Rice wrote also that

* This JOURNAL 45: 232. July 1955.

on his doctor's recommendation, he was resigning from the chairmanship.

Dr. McPherson suggested that a news item regarding the grant funds be placed in the Journal. The Secretary read a letter from Hans Nussbaum of the AAAS regarding the status of the grant funds, at present totaling $524.50, for which a check will be sent "upon receipt of the following information: name of the applicant(s) selected . . . ; his address and institution; his research project; the special purpose for which he intends to use the funds; the amount of the grant."

Dr. Curtis presented the second reading of nominations for membership. The motion to elect those proposed carried unanimously.

The President, who served as Chairman of a Special Committee on coordinating activities in promoting science talent in the Greater Washington Area, reported that this committee, composed of representatives from the D. C. Council of Engineers and Architects and individual societies active in promoting science talent, including the Washington Academy of Sciences, had accepted a plan drawn up by a subcommittee. It was decided that the plan be referred to the Committee on Policy and Planning for an opinion on mechanism and that the committee report back to the Board by August 1.

The Secretary reported the death of Dr. John Putnam Marble on June 6, 1955.

483D MEETING OF BOARD OF MANAGERS

The 483d meeting of the Board of Managers, held in the Cameron Room of the Cosmos Club, July 27, 1955, was called to order by the President.

A group of nominees for membership was put up by Dr. Curtis and unanimously approved by the Board.

The main business of the meeting was the consideration of a report of the Policy and Planning Committee regarding the cooperative effort between the Washington Academy and its affiliates and the D. C. Council of Engineering and Architecture and its affiliates for science promotion in the Greater Washington Area. A discussion followed Dr. Crittenden's presentation and comments. It was suggested by Dr. Crittenden that the President set up a committee with wide representation from the affiliates of the Academy.

Dr. Mason asked about the activities of the National Science Foundation and the National Research Council in using Arlington County as a pilot area for the encouragement of science talent through the PTAs and school boards.

Dr. Gibson's motion that the Crittenden report be accepted with (3) modified to direct that the President set up a Planning committee for coordinating present group activities, for handling urgent matters, and for developing new activities and facilities as needed, was unanimously approved.

Regarding other matters handled by his committee, Dr. Crittenden stated that no change need be made in the Bylaws or standing rules to provide for electing honorary members. However, the committee drew up a set of instructions for the use of those who wish to nominate honorary members. Mr. Setzler suggested that these instructions be included in the files which are passed from one Committee chairman to the next.

The Policy and Planning Committee had concluded that is not desirable to change the Bylaws to create a new class of members in the educational field. This was unanimously approved, as was the opinion of the Committee that affiliation with the National Science Teachers Association is inappropriate, since the Academy is authorized to act "as a Federal head of the affiliated scientific societies of *Washington*."

It was pointed out that science teachers are often members of affiliated societies of the Washington Academy.

484TH MEETING OF BOARD OF MANAGERS

The 484th meeting of the Board of Managers, held in the Conference Room of the National Science Foundation on October 18, 1955, was called to order by the President.

Dr. Pittman announced the appointment to the Planning Committee for Coordinating Science Education Activities of various groups of: Keith C. Johnson, Martin A. Mason, Arnold H. Scott, Raymond J. Seeger, and John K. Taylor. With five representatives from the D. C. Council for Engineering and Architectural Societies the Joint Board on Science Education for the Greater Washington Area has been formed. The Academy is a sponsor for the 1956 Engineers' Week Assembly. Dean Martin A. Mason was appointed to the General Chairman's advisory committee.

The Secretary reported the action of the Executive Committee in nominating as Associate Editor, Ronald Bamford. The nomination was approved.

In the absence of Dr. Curtis, the Secretary distributed a list of nominations for membership.

In the absence of Chairman Seeger, Dr. Pittman presented a report: that the Board should consider disposition of the present Committee on Science Education, whether to dissolve it or continue it, either with representatives from the Academy on the cooperative committee with the D. C. Council or as an advisory committee to the President of the Academy. Discussion was in favor of continuing the committee.

Dr. Rubey asked if the Academy was following the science education activities of the National Research Council. Dr. Pittman answered in the affirmative, giving examples.

There was discussion regarding the level of presentation necessary to interest secondary-school teachers. Dr. Frenkiel suggested that there be developed more contact with the teachers in the various secondary schools and suggested that the

President ask the affiliated societies to attract eligible teachers to membership in their societies.

The Committee suggested that the Board of Managers match the $200 contribution of the D. C. Council to defray the expenses in connection with the activities of the Joint Board to take care of the present need. This was voted and carried as a nonrecurrent item.

President Pittman then read a letter from President-elect Gibson pointing out that among 3,100 industries employing scientists, very few are doing anything to support science and mathematics in schools and are only belatedly becoming aware of their concern in this matter and that there is a serious problem which will become worse in the future.

Ways and Means Chairman Frenkiel spoke on the various activities of his committee relating to (a) the increase in the price of reprints, (b) the general future of the Journal, (c) the use of Journal space for a long article with extensive mathematical tables. While the Committee conceded that this type of material is not representative of the physical sciences papers, the particular paper was important and its publication well justified.

Dr. Frenkiel went on to outline the possibility of publishing a bulletin issued with the Journal but not bound in it, in which one or two pages from each affiliated society might be printed, and the possibility of using advertising matter of an appropriate character in such a bulletin. He noted that the problems in connection with the costs of the Journal and reprints were causing considerable dissatisfaction among authors likely to publish in the Journal.

It came out in discussion that the actual cost to the Academy is about 25 percent less than the published cost of reprints, this differential represents the overhead of the editorial office.

Dr. Cook pointed out that tear sheets might be provided to authors at no cost. Dr. Gurney brought up the possibility of reducing the cost to authors who have no support and marking up the cost to institutes bearing this expense, as is customary with some other journals. He pointed out that the heterogeneous character of our Journal makes the use of reprints more desirable than is the case with other journals.

Further discussion brought out the fact that the total printing figure might have an effect on the unit cost.

Dr. Cook pointed out that although the cost per copy of the Journal is 40 cents, overprinting copies are only 10 cents, and Editor-elect Page had found that such overprinting, indicating a particular article by the author on the cover, might be substituted for the reprinting of a paper.

The treasurer reported that a $1,000 bond had come due, and been cashed. His request that he be authorized to reinvest this sum in the Washington Mutual Investors Fund was approved.

485TH MEETING OF BOARD OF MANAGERS

The 485th meeting of the Board of Managers, held in the Tayloe Room of the Cosmos Club, November 15, 1955, was called to order by the President.

Dr. Poos, chairman of the Committee on Awards for Scientific Achievement, reported that nominations for awards were being processed and asked who was responsible for the preparation of the presentation program. It was determined that this is ordinarily set up by the Meetings Committee with the assistance of the Awards Committee.

A report for the Committee on Encouragement of Science Talent was given by Dr. McPherson, who then brought up questions regarding the area in which merit awards may be given. The committee had heretofore drawn only from the Westinghouse science talent winners. He pointed out that there are four other competitions sponsored by national science groups which could be brought into this area of recommendation. No action was taken.

Dr. Frenkiel called attention to the fact that National Science Fair exhibitors who were runners-up in the area of the Institute for Aeronautic Sciences were sent letters of congratulation and invited to visit local laboratories. He recommended the Institute's activity to other societies. Dr. Hough added that the astronomy winners were invited to the Army Map Service for similar recognition.

Dr. Walton stated that in his opinion and that of others with whom he had discussed the matter many entries in past science fairs were fine hobby-show material but did not represent research or even science projects and that with this in mind he would suggest the Academy take a stronger hand in pointing up criteria for scientific content. A discussion brought out that judging will be even more complex, with four area fairs rather than a single one as in the past.

President Pittman reported for the Chairman of the Committee on Science Education that the special meetings of science teachers in the four disciplines had been held; about 200 teachers were reached. She said that on December 9 the activities of the Joint Board and its subcommittees would be presented to especially invited representatives from all the affiliated societies of the Academy and the Council. Dr. McPherson pointed out the importance of this meeting, at which the matter of raising funds and of opening a central office will be taken up.

Dr. Curtis presented a slate of nominees for membership.

Dr. Wood reported the activities of the Nominating Committee and indicated that further nominations from the membership can be made under the rules set up in the Bylaws.

The Chairman of the Committee on Ways and Means, Dr. Frenkiel, reported that the Committee has concluded that the reasons for

a change of printer were less cogent than supposed.

Dr. Frenkiel pointed out that the problem of preparing tear sheets could be met by an expedient which was incidentally achieved in the last issue by starting each paper at the head of a page, thus facilitating the separation of papers, and by arrangements that extra copies of the Journal could be used for such a purpose.

Dr. Frenkiel reported that his committee is seriously considering a report which will recommend temporary but immediate means to relieve the situation regarding reprint costs such as the item mentioned above and permission to authors to buy copies of the Journal in lieu of reprints.

Dr. Frenkiel observed that considerable consultation will be necessary before the bulletin can be planned.

Recommendations of the Committee on Ways and Means about notices are: (1) to include them in the lists distributed to libraries and institutions not regularly carrying Academy news, (2) to distribute large notices for posting, and (3) to forward to each Vice President of the affiliated Societies a number of notices for distribution to their members who are not also members of the Academy, this number to be determined by consultation with the Vice Presidents. Also, Journals should be mailed to the Secretary of each affiliated Society which does not normally receive them.

Mr. Rappleye pointed out that since Dr. Frenkiel's remarks impinge on the budget and financial arrangements of the Academy, items of his discussion relating to expenditures should be referred to the Executive Committee. Dr. Frenkiel then asked that his implied recommendations be considered only as a report and stated that a written report will be made to the President for further action.

The Secretary reported the death of Harold R. Sandstead on November 1. Members of the Board reported the death of George E. Holm on November 11.

The Treasurer read a letter from Dr. H. C. Hayes requesting retirement and one from Dr. Mary E. Reid requesting that her membership be changed to an associate category, but in view of her long membership Mr. Rappleye moved that she, as well as Dr. Hayes, be placed on the retired list. The motion was unanimously carried. Mr. Rappleye reported the reinvestment of matured series E bonds in the Washington Mutual Investors Fund to the extent of $1,002.

President Pittman reported that Dr. Cook was leaving the Washington area, but that the operations of the Journal would be carried on by Dr. Fenner Chace for the balance of the year.

Dr. McPherson asked for an opinion on criteria for honorary membership. He pointed out that there are a number of Washington area members of the National Academy of Sciences who have the qualifications for honorary membership in the Washington Academy of Sciences.

President Pittman brought up the matter of popular attitudes toward scientists and active discussion developed regarding means to improve them.

486TH MEETING OF BOARD OF MANAGERS

The 486th meeting of the Board of Managers, held in the Tayloe Room of the Cosmos Club on December 20, 1955, was called to order by the President.

It was announced that the annual meeting would be held at the Kennedy-Warren on January 19, 1956, the address to be by a Department of Agriculture speaker on the world food supply. A motion by Dr. Frenkiel that the President make a short summary of actions of the Academy and select from the Committee reports material for a single report at the annual meeting was approved.

. Dr. Branham reported for the Subcommittee on Biological Sciences, recommending Lt. Col. Robert Traub and a joint husband and wife award for Dr. Clifford Evans and Dr. Betty J. Meggers.

Dr. Hickley, representing the Engineering Sciences Subcommittee, recommended Mr. E. Arthur Benney; Dr. Snavely, Physical Sciences Subcommittee, recommended Dr. Terrell Leslie Hill in the field of chemistry; Dr. Mason, the Teaching Sciences Subcommittee, recommended Mrs. Helen Nale Cooper and suggested that the Board might ask Dr. Watson Davis to assist in presenting the award. All the foregoing recommendations were passed.

In Dr. Seegar's absence, President Pittman reported that a meeting of the Committee on Science Education had been held with representatives from the affiliated societies and that a list of the Board members and the school contact scientists for the secondary schools had been issued. A letter is being sent to the affiliated societies to raise funds.

The Secretary distributed a list of nominations furnished by Dr. Curtis, chairman of the Committee on Membership.

Dr. Frenkiel reported for the Ways and Means Committee: (1) that registers of the WAS membership will be made available to committees or their chairmen indicating the affiliations with respect to employment and membership in societies and the general area of the members' experience; (2) that it was planned to publish a Directory in 1956.

He then moved that the Board consider the formation of a special committee on public relations that might ultimately become a standing committee. Dr. Frenkiel pointed out that such a committee could immediately act in connection with the annual meeting and would constitute a going committee when new officers take over. It was mentioned that the present participation of the Academy in the weekly science calendar already amounts to $75. Dr. Frenkiel stated that the Academy needs more than simple listing that there should be press releases so worded that

reporters unacquainted with scientific vocabularies could use them, and that advance copy with regard to speeches and other presentations made at the meetings should be procured. He observed that laboratories and other institutions can help. He added that school contact operations, now taken care of by a separate committee, should not be among the activities of the proposed public relations committee.

Dr. Page described the public relations committee as dealing with an unspecified public rather than special areas of interest. Dr. Stevenson said that some of the affiliated societies should be served by such a committee since they are largely uninformed about specific activities of the WAS. Dr. Page pointed out that members of societies are likely to be interested only in specific activities which the committee could sort out for them.

Dr. Scott noted that the meetings committee is constrained to delay its issuance of notice until the third week of the month, and Dr. Poos pointed out that some of the societies meet before the Academy does; therefore sufficient advance notice should be given to reach their membership.

The original question was called for, and the motion was passed.

Dr. Frenkiel reminded the Board that recommendations already made in regard to cost of reprints were to be supplemented by a report, of which he distributed copies. Dr. Mason recommended that the report he tabled until a statement of the cost can be shown to the Board. Dr. Frenkiel replied that the committee did not feel that it was recommending an action which would result in increased costs. Mr. Rappleye pointed out that the whole matter was discretionary with the Editor, since he was given a lump sum budget item plus charges to authors which he could handle as he saw fit. Dr. Frenkiel noted that the Editor had requested no further monies, although authorized to do so. Dr. Mason took the position that there was a policy question involved in these recommendations bearing on finances. Dr. Frenkiel agreed in part that this was true with regard to (1) page charges, and (2) exemptions from regular page costs. Dr. Gurney felt that some action should be taken since he understood that the situation he had resulted in new members being held from proposal and papers being held out of the Journal until some solution to the problem could be effected. Dr. Gibson observed that authors had come to expect much more than they were prepared to pay for. He pointed out again the proposal with regard to tear sheets and the changed pagination and he also pointed out that it was the Editor's responsibility to set up the reprint cost in a realistic manner. Dr. Gibson said that the only matter for consideration should be the page charges and that the Board should leave to the Editor the problem of what charges he would solicit from authors and organizations. A motion by Dr. Gibson, that the Editor explore the possibility of page charges and whatever alternatives might be available, was unanimously passed.

Dr. Frenkiel pointed out that the exemption from payment was a delegated authority which the Editor needed to exercise because in some cases papers were sent to the Journal on the Editor's invitation and a fixed policy could create difficulty. The Ways and Means Committee was given a vote of thanks for its detailed activity in connection with the matter of the financing of the Journal.

The Secretary reported that the Smithsonian Institution could no longer house the back numbers of the Journal which are stored there. Dr. Gurney moved that a committee on the disposal and storage of this material be appointed. Passed.

The Treasurer reported that Chauncey G. Peters had died on December 15, 1955.

FEATURED SPEAKERS AT ACADEMY MEETINGS IN 1955

408th (Annual) meeting, January 20, 1955: "Exploring the Past in Panama," by Dr. MATTHEW W. STIRLING, Director of the Bureau of American Ethnology, Smithsonian Institution, illustrated with color film lent by the National Geographic Society.

409th meeting, February 17, 1955: "A Tree from the Viewpoint of Lightning," by Dr. FRANCIS M. DEFANDORF, retiring President of the Academy, Chief of the Electrical Instruments Section, National Bureau of Standards. Published in this Journal **45:** 333–339. November 1955.

410th meeting, March 17, 1955, "Detecting Transient Constituents of Chemical Reactions," by Dr. SAMUEL N. FONER, Group Supervisor, Applied Physics Laboratory, Johns Hopkins University; "Recent Developments on Ocular Toxoplasmosis," by Dr. LEON JACOBS, Head of the Section on Protozoan Diseases, National Institute of Allergy and Infectious Diseases; and "Solidation of Metals," by W. S. PELLINI, Superintendant of the Metallurgy Division, Naval Research Laboratory.

411th meeting, April 21, 1955, "Use of Preserved Tissue Grafts in Surgery," by Lt. WILLIAM H. SEWELL, M.C., U.S.N.R., Naval Medical Research Institute.

412th meeting, May 19, 1955, "The Proposed U. S. Meteorological Program for the International Geophysical Year," by Dr. HARRY WEXLER, Chief of the Scientific Service Division, U. S. Weather Bureau.

413th meeting, October 20, 1955, "Hydrology by Tritium Measurement (Movement of Water in the Atmosphere and on the Earth's Surface as Revealed by Cosmic Ray and Man Made Tritium)," by Dr. W. F. LIBBY, Member, U. S. Atomic Energy Commission.

414th meeting, November 17, 1955, "Long Term Medical Effects of Radiation in Man," by Lt. Col. CARL F. TESSMER, M.C., U.S.A., and "Recovery from Acute Radiation Injury," by Capt. F. L. JENNINGS, M.C., U.S.A.

415th meeting, December 15, 1955, "Genetics in the Service of Man," by Dr. BENTLEY GLASS, Professor of Biology, Johns Hopkins University.

58TH ANNUAL MEETING

The 58th Annual Meeting of the Academy was held as a dinner meeting in the ball room of the Kennedy-Warren Hotel on the evening of January 19, 1956. President Margaret Pittman presided.

After dinner Dr. Pittman called the meeting to order and the minutes of the 57th Annual Meeting were approved as published in this Journal **45:** 86–92. 1955.

The Treasurer reported on the financial status of the Academy, and the Auditing Committee reported the Treasurer's statements to be in order. In lieu of separate reports by various officers, President Pittman presented a brief report summarizing the activities of the Academy and the Board in 1955. Formal reports of the officers and committees were filed with the Secretary.

Award for scientific achievement for the Biological Sciences was presented jointly to Clifford Evans and Betty J. Meggers in recognition of their outstanding contributions in the field of Archeology. They were introduced by Dr. Remington Kellogg, Director, U. S. National Museum. A second award in the Biological Sciences was made to Robert Traub in recognition of his distinguished contributions in the field of entomology. He was introduced by Brig. Gen. John R. Wood, Commandant, Walter Reed Army Institute of Research. Award for the Engineering Sciences was made to E. Arthur Bonney in recognition of his outstanding contribution in the field of supersonic aerodynamics. He was introduced by Dr. Ralph E. Gibson, Director, Applied Physics Laboratory, Johns Hopkins University. Award of the Physical Sciences was made to Terrell Leslie Hill in recognition of his notable contributions in the field of physical chemistry. He was introduced by Capt. Wilbur E. Kellum, Commanding Officer, Naval Medical Research Institute. An award was made for the teaching of science to Helen Nale Cooper in recognition of her distinguished career in the teaching of high school mathematics. She was introduced by Mr. Watson Davis, Director of Science Service and of Science Clubs of America. The meeting was then addressed by Dr. Gustave Burmeister, Assistant Administrator, Foreign Agricultural Service, U. S. Department of Agriculture, on the subject of world agriculture and food supply situation. In addition to his oral presentation, Dr. Burmeister showed a motion-picture film on the procedures used in growing rice in the Orient and in the United States, showing how modern methods have enabled the United States to compete in this agricultural field in foreign markets.

The following nominees for Vice Presidents representing the Affiliated Societies were elected by the Academy:

LAWRENCE A. WOOD—The Philosophical Society of Washington.
FRANK M. SETZLER—Anthropological Society of Washington.
HERBERT G. DEIGNAN—Biological Society of Washington.
WILLIAM W. WALTON—Chemical Society of Washington.
F. W. POOS—Entomological Society of Washington.
ALEXANDER WETMORE—National Geographic Society.
EDWIN T. MCKNIGHT—Geological Society of Washington.
FREDERICK O. COE—Medical Society of the District of Columbia.
GILBERT GROSVENOR—Columbia Historical Society.
S. L. EMSWELLER—Botanical Society of Washington.
GEORGE F. GRAVATT—Society of American Foresters.
HERBERT G. DORSEY—Washington Society of Engineers & Institute of Engineers.
ARNOLD H. SCOTT—American Institute of Electrical Engineers.
RICHARD S. DILL—American Society of Mechanical Engineers.
JOHN S. ANDREWS—Helminthological Society of Washington.
LLOYD A. BURKEY—Society of American Bacteriologists.
FLOYD A. HOUGH—Society of American Military Engineers.
DOUGLAS E. PARSONS—American Society of Civil Engineers.
W. C. HELL—Society of Experimental Biology & Medicine.
THOMAS G. DIGGES—American Society for Metals.
ROBERT M. STEPHAN—International Association for Dental Research.
F. N. FRENKIEL—Institute of the Aeronautical Sciences.
FRANCIS W. REICHELDERFER—American Meteorological Society.

The following members were reported to the membership as deceased in 1955 and in prior years as shown:

1955

W. M. JARDINE	January 17
G. H. PARKER	March 26
G. EGLOFF	April 29
J. P. MARBLE	June 6
C. E. WATERS	July 29
H. S. JACOBY	August 1
W. J. HALE	August 8
H. R. SANDSTEAD	November 1
G. E. HOLM	November 11
E. KIRK	November 16
C. G. PETERS	December 14
J. L. HOWE	December 20
BROTHER LEON (JOSEPH SYLVESTRE SAGET Y BARBIER)	? 1955

1954

THEODORE LYMAN	October 11
A. G. MCCALL	October 19
ARMIN O. LEUSCHNER	April 22
FRANCIS E. FOX	December 2

Previous to 1953

V. BJERKNES	1951
A. PENCK	1945
P. MARCHAL	1942
J. SCHOKALSKY	1940
W. WIEN	1928

After acceptance by the members of the Academy of the report of the Chairman of the Committee of Tellers, President Pittman declared the following elected:

President-elect—WILLIAM W. RUBEY
Secretary—HEINZ SPECHT
Treasurer—HOWARD S. RAPPLEYE
Board of Managers—FRANK L. CAMPBELL and F. N. FRENKIEL (to serve to January 1959)

Vote on the proposed revisions of Bylaw changing method and conditions for retirement was reported: 313 for and 6 against.

Dr. Pittman then introduced the new President, Dr. Ralph E. Gibson, and after a few remarks President Gibson adjourned the meeting

o. 10

ty.
shington.
District of

.
on.
ers.
ngineers &

trical En-

nical En-

Washington.
ologists.
Engineers.
Engineers.
Medicine.
.
for Dental

iences.
logical So-

d to the
rior years

anuary 17
March 26
April 29
une 6
uly 29
August 1
August 8
November 1
November 1
November 1
December 14
December 28

1955

October 11
October 19
April 22
December 2

1931
1945
1942
1940
1928

the Acad
the Com
eclared th

f

MPBELL AD
uary 1950
of Bylaw
retiremen

new Pres
a few r
e meetin